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WORLD CROPS

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Editorial Comment

A Happy New Year

ONCE more we start another volume of WORLD CROPS, and once more is it our pleasure and duty to wish our readers in all parts of the world the compliments of the season and all success and prosperity in the coming 12 months. On another page there appears the appraisement and review of the world agricultural position during the past year, based largely on the admirable and authoritative survey which FAO produces annually, and which we have made a feature of in our January issue for a number of years past. From this, it is clear that the improvement in the international situation of and outlook for agriculture which first manifested itself two years ago has been well maintained and that the anxieties about future supplies of food and consumer goods for growing world populations are less immediately urgent than they were formerly; moreover, the immediate prospect of surplus supplies of certain commodities has been alleviated, thanks, it is true, to a summer season which has been unfavourable far beyond the average. The anxieties on the political score have also been alleviated considerably in a number of directions; in short, the outlook on both the material and the political side is, on the whole, definitely brighter than at any time since the war. It is, unfortunately, the case that rival political ideas and ideologies are never entirely free from the risk of suddenly bursting into explosive activity, but let us hope that the age of reason and common sense may really prove to be approaching and that 1955 may in its turn mark another step in the path to the era of world peace and plenty which political mentors never tire of assuring us is really only just round the corner.

The pesticides group of the Society of Chemical Industry

THREE years ago, the Society of Chemical Industry inaugurated the Crop Protection Panel as an adjunct of its Agriculture Group. The work of the panel has proved very successful; the fact that with the control of pests and diseases of crops must be associated other non-agricultural aspects of industry decided the society to elevate the panel from its present status to that of a separate group of the society; at the same time its name was changed to that of the Pesticides Group. It was recently inaugurated with Dr. R. A. E. Galley in the capacity of its first chairman.

The opening meeting of the group took place at the Royal Institution on Monday, October 15. After referring to the formation of the Crop Protection Panel as recently as 1950 and offering congratulations on its elevation to group status, Sir William Ogg formally opened the proceedings and asked Dr. R. A. E. Galley to take the chair. After reading out messages of congratulation from absent members and friends of the group, Dr. Galley called upon three speakers to present papers on ' The Crop Protection Products Approvals Scheme.'

A brief report of these appears on another page in this issue of WORLD CROPS. We take the opportunity of extending our best wishes to the new group for a prolonged and extending career of usefulness.

The Malayan Rubber Mission

IN view of the difficult position of the Malayan rubber industry, the Government of the Federation of Malaya in June of this year announced the appointment of a mission to enquire into certain matters connected with the rubber industry. This mission issued its report at the end of September last. Since it appeared, it has been the subject of much discussion and in some respects its recommendations have been somewhat severely criticised, the most authoritative and, it must be admitted, possibly the most severe having been the recent statement of Sir John Hay to the shareholders of the United Sua Betong Rubber Estates.

It must be admitted that the findings of the report definitely are on the gloomy side. For example, it states that ' just as synthetic dyes killed the natural indigo industry, so it is by no means impossible that synthetic rubber should kill the natural rubber industry.' That ' the future difficulties of the natural rubber industry are immense and that the present is the last chance which the industry will have of setting its house in order before the storm breaks.' ' That if the present state of affairs is allowed to continue the end of the rubber industry is inevitable within the next 15 or 20 years. If things are allowed to stay as they are the rubber industry and with it Malaya itself is doomed.'

While we cannot but agree that the outlook for the rubber industry is difficult at present and that there is need for all practicable measures to safeguard the plantation industry from the competition of the synthetic product, it is hard indeed for those who know Malayan conditions not to regard such statements as the foregoing as partaking of the nature—in Sir John Hay's elegant phrase—of ' free indulgence in hyperbole directed to conditioning the mind to accept proposals which the mission themselves acknowledge to be open to theoretical and practical objections.'

Indeed, one cannot help being irresistibly reminded of the impassioned terms in which some years ago

H.M. Government were adjured to embark upon the ill-fated East African groundnuts scheme which resulted in consigning some £38 million of taxpayers' money down the drain.

Actually, the parallel with the indigo industry in India is far from exact, for when Bayer's indigo synthesis paved the way for the replacement of natural indigo with the synthetic product the plantation indigo industry had done nothing to improve its methods by the application of science and so, despite some ineffective struggles at the last moment, fell an easy victim.

Plantation rubber, on the other hand, is the child of scientific research and it is research alone which has enabled it to attain and retain the position it has won. Truly, it is necessary to redouble efforts to enable it to surmount its present difficulties, but there seems to be no valid reason to adopt an attitude of such extreme pessimism or to suppose that the combination of scientific advice and business acumen which enabled the plantation industry to achieve its predominant position in the past will not continue to stand the industry in good stead in the future.

The proposals of the mission

THE essence of the mission's proposals is that drastic methods of compulsion must be adopted to accelerate the replacement of the old-fashioned seedling rubber which originally composed the whole of the rubber plantations by high-yielding material, either budded rubber or seedlings of high-yielding rubber clones. They conclude that regular replanting should be compulsory, that Government action to enable it is essential, and they propose the imposition of a replanting cess on all estates rubber which is returnable, less administrative expenses, against expenses incurred to meet the cost. Already there exists a replanting cess which is returnable to estates to the extent to which they spend money on replanting, but this the mission regard as inadequate. By the planting body also it is not apparently regarded with favour, as witness a statement in a recent speech of Mr. J. K. Swaine, chairman of the Singapore Para Rubber Estates, who caustically observes that refunds under this arrangement arouse much the same pleasurable sensations as the return to its owner of a stolen wallet.

Indeed, one is compelled to wonder how far the anxieties of the mission are justified, and whether their proposals are, in fact, warranted so far as estates are concerned, no matter how far Government action may, in fact, be needed to assist the peasant rubber grower who accounts for nearly half the total area planted in rubber in the Malayan Union. We must not forget that the record of estates in the matter of replanting seems by no means sc poor as the mission would have us believe. Actually, since the cessation of hostilities over 300,000 acres have been replanted in high-yielding material, while the percentage which high-yielding material bears to the total area under rubber on estates is roughly 36%. Bearing in mind that rubber prices have fluctuated greatly since the war, that operating costs have increased about fivefold since before the war, that estate operations have been handicapped by banditry and that the industry has been hampered by crippling taxation, one is prompted to wonder whether Sir John Hay may not be right when he suggests that if the Malayan Governments directed their energies to the supreme task of suppressing the banditry with which the industry is still threatened and maintaining law and order the outlook for the industry would be improved and free enterprise would be able to function more efficiently for its benefit.

The 68th Dairy Show

THE 68th Annual Dairy Show organised by the British Dairy Farmers' Association took place at Olympia from October 21 to 24 and attracted large attendances.

The display of British dairy breed cows was, as usual, of surpassing excellence, and universal admiration was evoked by the wonderful run of Friesians, Ayrshires, milking shorthorns, Channel Island cattle and other breeds that appeared. The show was remarkable in that for the first time the long-contested struggle for supremacy between Friesian and Ayrshire breeds went on this occasion to the Ayrshires, the supreme individual championship of the show being gained by the Ayrshire cow Blockfield Navybell, belonging to Mrs. M. K. Anderson, of East Grinstead, Sussex, which, by the narrow margin of half a point, beat its most formidable rival, the British Friesian cow Terling Boukje, owned by Castle Howard Estates Ltd., of York. Nine breeds competed for this championship, which was awarded after points gained on inspection and in milking trials were added together.

Further success was gained by the Ayrshire breed in the test for the B.D.F.A. Coronation Cup, which was awarded for points on inspection of teams of six animals that had qualified in the milking trials.

Apart from the exhibit of dairy livestock, the show was remarkable for the fact that for the first time the members of the Dairy Engineers' Association had agreed not to exhibit their plant and agricultural machinery, but to take only office space at Olympia. As a result, the exhibits in the body of the hall were not, as on previous occasions, overwhelmed by the predominance of shiny dairy equipment. This, however, did not signify that it was an off year for the show, because there were still large numbers of exhibits of dairy farm appliances and commercial matters of interest for dairy farmers.

The galleries contained the poultry, pigeon, rabbit and accessories exhibits, while a number of new demonstrations and competitions were introduced. These included a milk bar, where milk, plain or flavoured milk shakes, butter and cream could be purchased. Another exhibit which attracted attention was of the cheeses of Great Britain, at which samples of all the cheeses manufactured in this country were exhibited and were on sale to the public.

The show, like its predecessors, must be accounted to have been very successful.

Salt of the earth

YET one more farming use for common salt seems to have been developed. Pressed sugar beet pulp, hitherto useable as a maintenance cattle food only in a fresh state soon after collecting from a sugar beet factory, has been successfully preserved by ensiling on an East Anglian farm. Salt comes into the picture because 14 lb. of salt are mixed with each ton of fresh pulp as it is put into the silage pit or clamp. The salt is said to assist in preservation and also to make the eventual feeding-stuff more palatable. From 20 to 40 lb. of the silage are fed to cattle per head per day as a supplement to concentrates. The ease with which this new kind of silage can be made, and the good condition of the final product, were recently shown at a demonstration jointly organised by the N.A.A.S. and the British Sugar Corporation. The farm concerned certainly provided a convincing background, for it carries a well-known herd of Jersey cattle whose cows have topped the 1,000-gallon average with a 5.9% butterfat content in the milk.

Salt is still an under-valued farming material. It has been used for centuries. It was being applied as a fertiliser before the scientific principles of fertiliser use had been unravelled; then by a grave error in policy a heavy tax was imposed upon salt to help foot the bill for the Napoleonic wars, and salt became far too dear for economic use on English farms. Much of the old knowledge about salt was lost during this long period of salt taxation, and it was not until the Hitler war when its special fertiliser virtues for sugar beet were discovered that a truly active interest revived. It is now more widely realised that salt also increases the yields of a number of other crops—fodder beet, mangolds, turnips, carrots, etc. Whether it increases grass output is uncertain, but there is a considerable amount of evidence that the application of salt improves the palatability and nutritional value of grazing. Is it the salt in coastal pastures that endows some of the famous marshland pastures with their long-known cattle fattening powers? Excessive applications of salt are useful in weed control, and more practical use could be made of this fact now that it is known that the rye grasses are particularly resistant to high concentrations of salt. Salt is also useful as a sweetening preservative for haymaking.

In most countries, salt is a cheap chemical substance. Britain is particularly well provided with her own salt resources. Nevertheless, much less salt is used each year in farming than one would expect from its diversity of benefits. Even with the very responsive sugar beet crop a large proportion of the acreage is still not fertilised with salt. Perhaps common salt is too common and neglect is the price of familiarity?

The British Weed Control Conference

ELSEWHERE in this issue will be found a report of the second British Weed Control Conference which took place at Harrogate at the commencement of November. The conference was on all hands admitted to have been a great success although the plethora of material which it brought forward may have given cause for an onset of that all too prevalent malady nowadays—mental indigestion.

It is surely remarkable that, in ten years, the discovery that certain compounds, which exercise a stimulating effect on plant growth are also efficient chemical weed killers, should have developed as the basis for a great new industry, and constitute the main topic to be considered by two large conferences in successive years in the United Kingdom as well as by a number of similar conferences in the U.S.A. and elsewhere.

To these must be added the many more numerous conferences on plant protection in which this type of substance has formed a substantial item in programmes which also dealt with fungicides and insecticides.

To some indeed it may almost seem that we are approaching a period when the chemist will be the only really important factor in agriculture and horticulture. With chemical synthetic soil conditioners, chemical fertilisers (not forgetting the trace elements) chemical weed killers, chemical insecticides and fungicides and so forth, the apotheosis of the chemist in agriculture may in fact seem imminent.

In such conditions, the warning of Sir James Scott Watson in his opening address and the remarks of Professor Sanders in his paper on the opening day, that chemical methods of weed eradication must not be assumed to be capable of replacing other aspects of good husbandry are apposite and may have come as a salutary bucket of cold water to over-enthusiastic exponents of chemical weed control methods.

It is indeed essential that, in the enthusiasms engendered by spectacular field results and conferential discussions, the fact should not be lost sight of that

chemical methods of treatment can be invaluable additional weapons in the agriculturist's armoury, but are in no sense a replacement for many of the older methods of crop husbandry that have proved their value in the past.

Reducing crop growth

ALMOST every act of agriculture is aimed at increasing the growth of crop plants, but the advent seven years ago of a plant growth inhibitor—MH or maleic hydrazide—has directed attention to a range of special circumstances in which reduction of growth is advantageous. Examples of this are the repression of sprouting in stored onion bulbs, potato tubers and several root vegetables, the inhibition of sucker growth that follows the topping of tobacco plants, and the discouragement of unwanted runner growth with strawberries. Maleic hydrazide has also been enthusiastically recommended for the reduction of growth in roadside grass verges and the control of growth in privet and similar hedges. Five years of MH use in Connecticut have shown that road verge mowings can be much reduced without adverse effect upon the health or appearance of the grass; in some cases the number of mowings during the growing season has been cut from 19 to two.

As is so often the case with new chemicals that influence plant growth, the centre of experimentation has been the United States. There already the scientific literature on MH is extensive. But two facts that emerge from the work so far published seem likely to affect similar studies of MH applications in other countries. To achieve desirable and specific inhibitions of growth at certain times in a plant's development, the MH ' dosages ' to be given must be very precise. Also, it has been found in the U.S. work that responses to MH are much less marked under low humidity conditions.

In a practical sense, these two facts or influences may prove most awkwardly antagonistic. If the dosage rate must be ' just right ' to obtain a particular effect, what happens when the humidity changes substantially during the critical period of, and soon after, application? In countries where humidity conditions vary considerably during the growing season MH effects will surely tend to be inconsistent. This could account for the disappointing results obtained in this country at the Sports Turf Research Institute (Yorkshire) with maleic hydrazide—' in trials in 1952 at two heights of cut, much damage was done. . . . Trials with further plots treated in the spring of 1953 confirm that the initial suppression of growth was accompanied with disfigurement of the turf . . . ' (*J. Sci. Food and Agric.*, **5**, 397, 1954).

In short, it may well be that the more promising experiences reported from America may have owed a good deal to favourable climatic conditions, and the reproduction of these results in different climatic conditions cannot be reliably anticipated.

Hurricane Hazel

IT has become the custom of the meteorological authorities in the United States to endow the hurricanes of the Eastern Caribbean, which of late years have adopted the habit of sweeping inland parallel with the Atlantic coast line, spreading desolation in their track, with feminine names suggestive of charming girlhood, which, having regard to the material damage which they occasion to life and property, appear to be rather inappropriate.

Among the most recent of these is one which, after a striking and destructive career in the United States, penetrated into Canada and brought death and destruction to the inhabitants of Eastern Ontario. For this majestic and desolating phenomenon the American meteorologists devised the charming but inappropriate designation of ' Hazel.' Small wonder that the good citizens of Eastern Ontario, and particularly the immediate environs of Toronto, should be filled with unbelieving wrath that with a name like this a disturbance should be capable of causing the death of some 80 persons and property loss valued at around $500 million.

Apparently, the greatest part of the damage was occasioned by flooding, the lower reaches of the River Humber having gone completely on the rampage as the result of a rainfall of 7 in. falling in 15 hours. The trouble seems to have been aggravated by the wholesale land clearing which has taken place in and around the devastated region. The forests of Eastern Ontario are reported to have been cut, burnt and bulldozed until they are now almost non-existent. Frequent warnings have been given by Canadian soil conservationists of the dangers, but so far without much avail, the attitude of provincial and local authorities having been one of indifference to the need for maintaining a sound land utilisation policy.

The results of this short-sighted policy were tragically evident on the night of October 19, when the hurricane struck this locality. It is not suggested that a sound conservation policy could have completely averted this cataclysm, but undoubtedly had adequate forest cover existed the damage would have been much less severe, for the run-off would have been controlled and smaller, while silt removal and deposit would also have been less.

It is to be hoped that as a result of this disaster the need for action will become appreciated, although it unfortunately cannot be expected to be productive of immediate benefit.

World Agricultural Production in 1954

Each year it has become the practice to give our readers a summary of the principal features of the world agricultural situation based mainly upon the annual survey which the Food and Agriculture Organisation of the United Nations provides. In accordance with this practice, we present below a summary of the main features of world agriculture during 1953-54 and the outlook for the coming year.

THE changed conditions which first began to manifest themselves in 1951-52 and became prominent in 1952-53 developed further in 1953-54. In some areas, indeed, surplus supplies of certain commodities, notably of wheat, became burdensome. In others, on the other hand, supplies of foodstuffs, although somewhat greater, remained nutritionally inadequate and were even lower than before the last war.

Agricultural production

The marked upward trend of aggregate world agricultural production continued in 1953-54, although the increase was less striking than in the previous year. The largest increases occurred in Western Europe and the Near East. The Far East and Oceania showed smaller gains, but in other regions there was little change in the overall level of production from 1952-53.

Most commodities shared in the increased production over 1952-53. World cereal production rose by 2% and, in spite of a poor crop in Japan, there was a welcome increase in rice production in the Far East which ended the most acute phase of the post-war rice shortage. Wheat production, however, declined owing to a smaller though still large crop in North America. There were also marked increases in the output of livestock products, especially milk, and of sugar, mainly because of a record beet crop in Europe. Jute production fell heavily owing to crop restrictions in Pakistan.

Over the last four years, world agricultural production is estimated to have increased by nearly 3% annually, compared with an annual increase in world population of about 1½%. World per caput production of all agricultural products and also of food regained, and indeed slightly exceeded, its pre-war level in 1952-53, and maintained that position in 1953-54.

There remain, however, marked disparities between regions. Thus per caput production in 1953-54 was about 17% in North America greater than before the war, and is also appreciably above the pre-war level in the Near East, Western Europe and Africa. On the other hand, in Latin America, the Far East and Oceania per caput production remained substantially less than before the war. Moreover, the still greater disparities in different parts of the world between the absolute levels of agricultural production, which primarily determine food consumption levels, remain as large as ever. Production per caput is, for example, some four to five times greater in North America and Oceania than in the Far East, the Near East and Africa.

Trade in agricultural products

In contrast to the expansion of agricultural production, the total volume of world trade in agricultural commodities has remained almost unchanged in recent years at almost exactly its 1934-38 level. In 1953, there was a marked fall in the trade in cereals, due mainly to good harvests and smaller import requirements in Western Europe and the Far East. But this fall is offset by larger shipments of sugar, vegetable oils, fruit, tobacco and coffee.

Farm prices and farm incomes

While farm price indices have fallen appreciably in North America, they

Silage making in England. Perennial rye grass being lifted with green crop loader for conveying to silage pit

have been considerably more stable in Western Europe, and in some countries in other regions, including the Far East, still show a rising trend. Farm prices would, of course, have fallen more steeply but for the operation of price support policies in many countries, and the sudden increase in the cost of such policies is causing concern to governments, taxpayers and producers. More and more governments are tending to reduce the support level, to limit their financial liabilities, or to adopt less rigid price support policies.

The ratio of prices received by farmers to prices paid for production requisites has moved to the disadvantage of farmers in nearly all countries in the past few years. In consequence, farm incomes have fallen sharply in North America, but they have been more stable in Western Europe, mainly because of the rapid rise in the volume of production. In Oceania, farm incomes have fluctuated widely in the last few years. Data are lacking for other regions.

The outlook for world production and demand

Production

Although it is too early to form any real judgment, it seems likely that world agricultural production will be maintained in 1954-55 and it may show some further increase. Crop restrictions and less favourable weather may limit the production of cereals, sugar and cotton. No marked recovery is expected in the production of jute and hard fibres, and the output of rubber may continue to decline slowly. On the other hand, increased supplies of oilseeds, coffee, tea and tobacco are expected.

Demand

A review of current economic trends suggests a slow improvement in demand for agricultural products in 1954-55, though, unless special measures are taken, this is unlikely to reduce to any extent the existing problem of agricultural surpluses. This emphasises the need for carefully planned and selective expansion of future agricultural production closely adjusted to market conditions.

Looking further ahead, the year 1955-56 seems likely to see a continued expansion in the demand for agricultural products. World supplies of grain and most other foodstuffs will continue to be relatively abundant, and to that extent food importing countries should enjoy favourable terms of trade. Prices of coffee should remain firm, and prices of most agricultural raw materials (including forest products) seem to be tending upwards after the post-Korean collapse, a tendency which would be strengthened by a revival of economic activity in the United States.

Regional production and outlook

Western Europe

Agricultural production in Western Europe in 1953-54 was greater, crops of sugar beet and grains being exceptionally heavy. Weather conditions were favourable up to mid-1954, but deteriorated thereafter ; improved methods contributed substantially to the higher yields. The progress in production coincided with a revival in economic activity in other sectors. Supplies were adequate to meet the rising demand, and for some products imports outside Europe were reduced. The general level of intra-European trade in agricultural products increased, though some countries experienced difficulties in disposing of unaccustomed surpluses. A substantial part of Western Europe's butter exports was taken up for the first time by the U.S.S.R.

Agricultural production is expected to continue to expand as the cumulative effect of the improved methods and more efficient equipment which have come into use in recent years becomes increasingly felt.

Eastern Europe and the U.S.S.R.

An important change of policy took place in 1953, when it was decided to devote more resources to consumer goods industries, particularly to agriculture. In recent years, the rapidly growing demand for food and agricultural raw materials has not been met. In future, agricultural production requisites are therefore to be made available in larger quantities for collective and especially for individual farms. Higher prices will be paid for deliveries, and other forms of financial assistance, such as investment credits, will be given.

North America

Stock disposal measures in the United States have limited or reduced stocks of some products, but have so far hardly affected the bulk of the holdings, more than half of which consist of grains. More vigorous measures are being taken to foster agricultural exports, but bad harvesting conditions in 1954 have affected the position here. The decision of the United States Commodity Credit Corporation to sell at world market prices means that in the future, United States price supports will no longer help to maintain international prices of some commodities.

Adjustment of output was applied in the United States during 1954 to wheat, maize and cotton and continued for tobacco, but the diversion of acre-

Wheat harvesting in Victoria, Australia

Citrus farms in the Rustenberg area of South Africa. A farmer's house is in the foreground with his established groves on the left and his newly-planted trees on the right

age to other crops and, in the case of maize, the non-compliance of farmers limited the over-all success of these measures. Acreage restrictions and marketing quotas are to be made more stringent in 1955. No marked changes are expected in the demand or supply situation in 1954-55, but supplies of crop products are likely to be appreciably lower in 1955-56, while supplies of livestock products will probably increase.

Latin America

Latin American agricultural exports in 1953 were 20% higher than in 1952, thus reversing the downward trend of the past few years. The increase was due to the recovery of Argentine cereal production in 1952-53 and to large shipments of sugar, cotton, coffee and cocoa. There was no appreciable increase in the total agricultural output in 1953-54, a moderate expansion in food production being offset by sharp declines in cotton, hard fibres and inedible oilseeds.

Far East

The acute phase of the post-war food shortage in the region has now come to an end and in 1953-54, with a record harvest in India, the total production of food grains, excluding China, may be 9 million tons (about 9%) above the pre-war level. Net imports of cereals, which continued to be high in 1953 due to short crops in Pakistan and Japan, will show a marked decline in 1954. Lower international prices for cereals are contributing to the economic difficulties in Burma and Thailand, whose revenues are drawn largely from rice exports. Surpluses of rice accumulated in these countries in late 1953 and exports are now moving more freely. But with increased production in importing countries, rice surpluses may reappear in late 1954 if current price relationships between rice and competing cereals persist.

The main problem in the region is still to raise the very low food consumption levels over most of the area. There has been a noticeable improvement in Japan since the war, but for the region as a whole per caput supplies show little or no improvement over the nutritionally inadequate pre-war level. As most countries in the region are concerned to maximise resources for general economic development, no rapid improvement in consumption levels can be expected.

Near East

The rapid post-war agricultural development in the Near East has been very unevenly distributed and has been largely concentrated in food exporting countries like Turkey, Syria and Iraq. It is in these countries that the effect of the surplus situation has been most serious, particularly in the cereals sector. Agricultural production in the food deficit countries has developed slowly and, on a per caput basis, has not yet regained its pre-war level.

Recent developments serve to emphasise the basic problems of Near Eastern agriculture, which are to establish a more intensive and diversified pattern of production with closer integration of crop and livestock husbandry, and to develop the domestic markets in order to improve nutritional standards and to reduce the heavy dependence of Near Eastern economies on agricultural exports.

Africa

In Africa, surpluses of agricultural produce are at present only of local significance, though the effects of surpluses in other parts of the world have already been sharply felt in some territories. For example, the fall in cotton prices reduced Uganda's favourable balance of trade to one-third of its 1952 level, while during 1953 the Nigeria Oil Palm Produce Marketing Board had for the first time to draw on its accumulated funds to meet guaranteed prices, which, however, will be somewhat lower in 1954. But the basic problems of African agricultural development remain as before and are only accentuated by the present world situation.

Oceania

No major adjustments to agricultural production have yet become necessary despite growing competition on world markets. The main difficulties have been for wheat and for such products as sugar and dried vine fruits, while increasing competition is being felt for exports of dairy products. Prospects for meat and wool are favourable.

With an expanding domestic demand for most export commodities the immediate outlook is favourable and it seems likely that agriculture can continue to expand without large readjustments. The main problem is rising production costs.

Position of some of the main commodities

Wheat

The advance in production in 1952-53 was continued in 1953-54, some decline in the major exporting countries being offset by increases in other countries. During the earlier part of 1953-54, stocks in these countries greatly exceeded the import requirements. On July 1, 1954, stocks were estimated to total 49 million tons, as compared with 34 million tons a year earlier.

Picking oranges on a South African farm

Since then, however, the situation has been radically changed owing to the bad weather conditions experienced in Northern Europe and many other parts of the Northern Hemisphere. In North America, also, stocks are reported to be substantially smaller; thus the wheat crop in Canada is believed to be 100 million bushels lower than last year. It is too early to assess the situation accurately, but it seems likely that at least a temporary halt may be put to the menacing growth of wheat stocks.

Coarse grains

Exports of coarse grains in 1953-54 were the same as in the previous year and carry-over stocks at the end of the year were larger than at the opening. Shipments to Europe were larger, although European production increased over 1952-53. Export prices declined during the year. United States supplies in 1954-55 may be at least as large as 1953-54, despite acreage restrictions on maize; exportable supplies of maize in Argentina will be somewhat larger owing to another increase in the crop. The bad harvesting conditions in the late summer and autumn in the Northern Hemisphere seem likely to affect the supply position in the same way as wheat.

Rice

Significantly more rice was harvested in 1953-54 than in any previous year. Two successive good harvests have greatly altered the supply position, but most exporters were reluctant to adjust their prices accordingly. Two main importers showed less willingness to buy, and world trade contracted sharply in 1953. Stocks began to accumulate in some areas and towards the end of 1953 export prices started to decline. World trade in rice will probably recover in 1954 from the low levels of 1953, owing largely to a rise in Japan's imports as a result of the very poor rice crop, and to the new financial settlement between India and Burma. There is plenty of scope for an increase in world imports, which in 1943 were well below the pre-war average, while per caput consumption of rice is still less than it was 15 years ago. Moreover, recent high prices for rice, apart from stimulating cultivation, have deflected demand to some extent to other cereals and to root crops. In pre-war days, rice was about nine-tenths of the total cereal imports of main Asian importing countries, but in 1952 the proportion was only one-third and in 1953 had fallen still further.

Sugar

International trade in sugar in 1953 reached an all time maximum with exports almost 1.8 million tons higher that in the previous year. Total world production of sugar in 1953-54 amounted to 36.8 million tons, as compared with 33.6 in the previous year and 24.9 average pre-war. Two major developments in the world sugar economy occurred during the year. Firstly, sugar surpluses developed outside the dollar area for the first time since the war, although they were comparatively small. Hitherto, Cuba had carried practically all the world surplus, and the effect of the change began to be felt in many countries. Secondly, an International Sugar Agreement, the object of which is to stabilise world sugar prices, was concluded in August 1953. A significant development was a sharp increase in sugar production in net importing countries and in exporting countries enjoying protected positions in import markets. Significant in this connection is the expansion of production in British Commonwealth countries and in the sugar producing countries of Western Europe, which now produce 3 million tons more than they did pre-war. Sugar consumption continued to increase, the greatest percentage increases having occurred in Africa, Asia and South America. It is probable that on the long-term basis, present trends of production consumption and prices will continue, although production in 1954-55 will probably be lower, particularly in Europe, by reason of the less favourable character of the season.

Fats, oils and oilseeds

There was a moderate decline in world production of fats and oils in 1953, largely owing to a sharp 'off-season' fall in the Mediterranean output of olive oil. World exports rose about 5%, reflecting substantially increased shipments from the United States and Africa. European import demand recovered from its low 1952 level and the general level of international prices of fats and oils was somewhat higher. The price of linseed oil was an outstanding exception and continued its downward trend, mainly as a result of heavy export sales from Argentine and from United States Government stocks.

Production and export supplies are larger in 1954 than in 1953. In West Africa, production and exports have materially increased and the United States and Argentine Governments have continued to sell large quantities for export. Most prices on the international markets declined moderately

in the first half of 1954 and the outlook is for a continued downward trend in the latter half of 1954 and early 1955.

Coffee

The supply of coffee has been substantially below the world demand even at the comparatively high prices which have prevailed. In 1953, production was about 3% below pre-war and only slightly higher than in the previous year. Prospects for a higher return in 1954 were nullified by the severe frost which occurred in the coffee lands of Brazil in July 1954, which destroyed the newly planted high-yielding areas in Parana province. Due to lowered production in Brazil, and also in some of the other major coffee-producing countries of Latin America, the continent's output as a whole declined. In Colombia, on the other hand, an exceptionally good yield was obtained.

In Africa and Asia, production is rising and better crops were obtained than in any previous post-war year. There will, however, have to be very considerable expansion of production in these regions before they can affect the predominant position held by the Latin American countries.

The immediate outlook is that probably less coffee will be available for export in 1954-55 unless the producing countries curtail their domestic consumption. Prices are likely to remain high despite the fact that consumer resistance has already commenced to manifest itself. It seems likely, however, that the position may improve in 1955-56. Some of Brazil's frost-stricken areas will have recovered, while the extension of coffee plantations all over the world, as the result of high prices in the past few years, should by then be bearing substantial crops and leading to a decline of market prices.

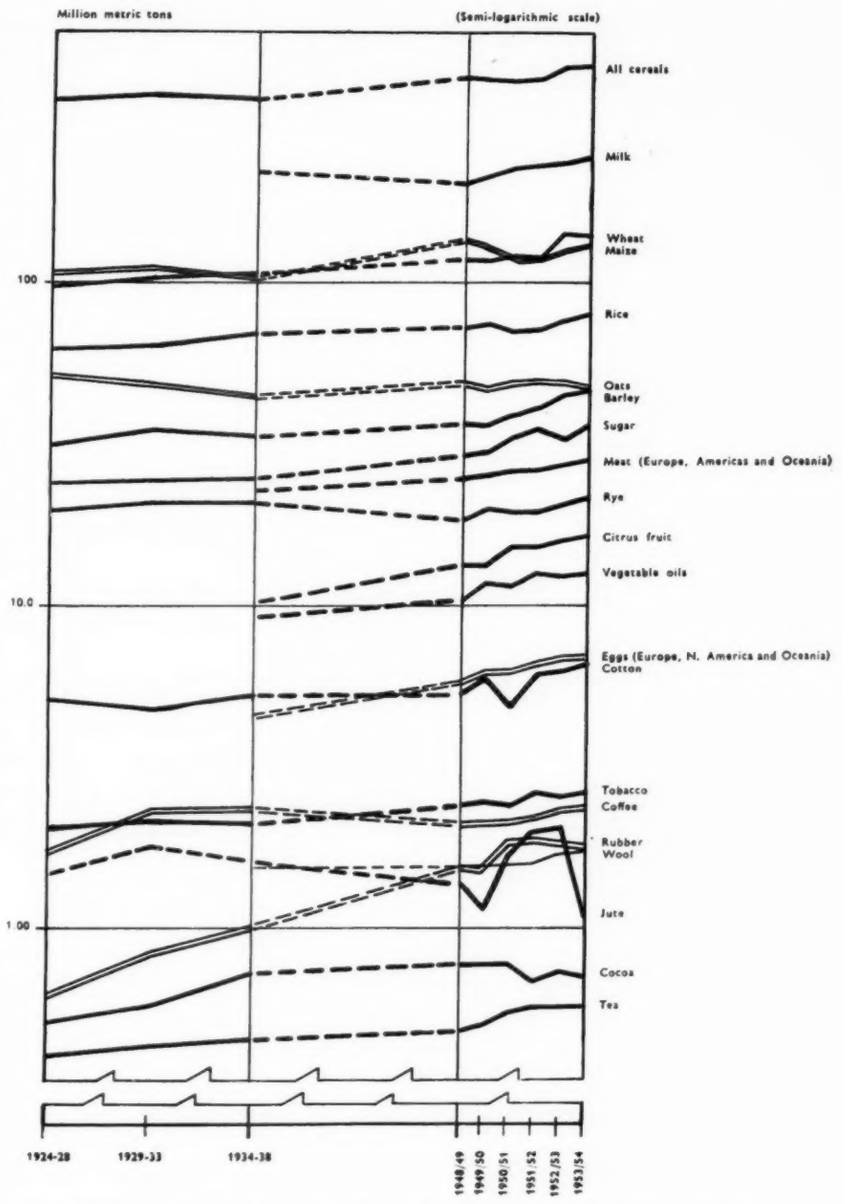
Tea

Owing to adverse weather, tea growers in Northern India did not fully implement their policy of crop restriction, but production fell below last year, accompanied by a marked improvement in quality of the crop. Output in Ceylon, South India and Pakistan increased, offsetting the small reduction in supplies from Indonesia and East Africa. Total world output is estimated to be 593,000 tons, excluding China and the U.S.S.R., slightly higher than 1952.

Prices for tea have risen considerably and have doubled since 1952. Given favourable weather, production in India, Ceylon, Pakistan and East Africa is likely to increase in view of the steady and increasing demand. It seems likely, however, that in India the industry will feel the burden of the additional taxation imposed to cover the cost of the increased social legislation. Consumption rose in Continental Europe and in the United States. The tea industry should be able to adapt itself to the increased world demand and production will probably rise in 1954.

Cocoa

Cocoa prices in 1954 reached the highest peak in more than half a century. In May, wholesale prices were about 60% higher than at the beginning of the crop year. Prices began to advance when it became evident that world production would be lower than in the previous year, due almost entirely to a sharp decline in the Gold Coast and Nigerian output. The most significant development was a strong rise in European consumption. Demand in Europe, especially Western Germany and the United Kingdom, reached unprecedented levels. Due to the normal time lag, the full effects of



Estimated world production of major agricultural products

the higher prices of cocoa beans have not yet been felt on the retail market. In the United States, the price increases severely affected demand, and the post-war downward trend of per caput consumption continued notwithstanding the high national income. The search for substitutes and ways to economise the use of cocoa has been intensified. The outcome of the 1954 crop will give some indication whether the 1953 production in Africa was a normal cyclical movement or the beginning of a long-term trend of declining production.

Tobacco

In 1953, world production of tobacco slightly exceeded that of 1952, the reduced output in the United States being more than matched by a remarkable increase in production of the Oriental types of cigarette tobacco. World trade increased over the low level of 1952. By the end of the year, the increase in the United States stocks was modest. Some increase in stocks of Oriental tobacco may be expected in 1954, although Oriental tobacco seems to be gradually regaining an important place in European consumption. Stocks of leaf tobacco in most importing countries are still substantially below the desirable level. On the whole, tobacco prices increased slightly in 1953-54. Consumption is increasing in nearly all countries and demand is strong. The improved balance of payments situation in Europe and United States sales of tobacco against payment in soft currencies are expected to increase North American exports in 1954-55, and world trade in 1954 is likely to be larger.

Cotton

World stocks at the end of the 1953-54 season are estimated at nearly eight months' consumption at current rates. Large stocks accumulated during the year in the United States, where, in spite of acreage reductions, exceptional yields resulted in a crop 7% greater than in 1952-53. Except in the United States, stocks were by no means excessive. Crops had been generally reduced in other major exporting countries, while the increased production of India, the U.S.S.R. and China was expected to be absorbed locally.

United States prices have been supported since the beginning of 1953 and remained fairly stable. With the United States decision to limit cotton production in 1954-55, however, the entire structure of cotton prices has tended to move upwards.

On average yields, a total United States crop of 11.5 million bales (30% less than in 1953-54) would be expected from the reduced area. World consumption is likely to be maintained in 1954-55 and, even allowing for possible increases in production in other exporting countries, some reduction in world stocks is in prospect. World trade has recently expanded under the influence of rising prices, but may level off as stocks in importing countries become replenished.

Jute

Including the Pakistan Jute Board's stocks, which were liquidated in the course of the season, the total supply of jute in 1953-54 was 9 million bales. This appears to have been adequate for current requirements, as international prices have not advanced to a great extent, though there has been a substantial recovery in prices to producers.

Activity in the jute manufacturing industry has been satisfactory. In Calcutta, an increase in hessian output compensated for a decline in the production of sacking, and there has been a recovery in Europe mill operations. In the United States, the rate of hessian consumption has been maintained, and there has been an increased use of jute goods in the United Kingdom. Prospects for the 1954-55 season are very uncertain. Although the price of raw jute favours an increased cultivation, it is reported that the Pakistan Government has again decided on a very restricted acreage. The condition of the crop is good, though the harvest is expected to be later than usual. As stocks have been substantially reduced, a further advance in raw jute prices may be expected if jute mill activity and the demand for jute goods are maintained.

Hard fibres

Production declined in 1953 for the first time since the war, although only by 7% The decline was practically confined to Latin America. The offtake, including strategic stockpile purchases, was not far out of line with output, so that prices were firmer than in the preceding year. There are, however, still considerable unsold stocks of henequen in Mexico and of sisal in French Africa, but Government stocks of sisal in Brazil have been virtually cleared.

Although consumption was heavy, North America greatly reduced its purchases of hard fibres. European and Japanese purchases, on the other hand, recovered. Commercial demand is expected to improve, although purchases for the stockpile are likely to be reduced. At the same time, the production of all hard fibres is expected to decline further.

Rubber

Production of rubber was again reduced during the year, while consumption expanded. The decline in production was mainly confined to smallholdings; estate production in both Malaya and Indonesia increased. The decline in small owner production reflects discouragement to tapping, resulting from the decline in rubber prices, and also in Malaya the introduction of a programme of subsidies to smallholdings to take them out of tapping to enable replanting with higher-yielding rubber trees. The increase in consumption was due to a rise in the total offtake of both natural and synthetic rubber, but more particularly to the recapture of a larger share of the total rubber market by the natural product. Actually, total rubber consumption increased by 150,000 tons, while consumption of the synthetic product fell by about 15,000 tons.

The price of rubber reached a minimum in February 1954, but has since recovered markedly. It is expected that total world consumption may decline somewhat: consumption of natural rubber is expected to increase by about 5%, while consumption of synthetic may fall sharply, particularly in the United States. The long-term outlook for the product is considered to be favourable.

Conclusion

On the whole, it can be said that the improvement in the world agricultural position, which manifested itself in 1952-53, has been maintained in the year under review in the majority of countries and also in respect of most agricultural products.

Photos: P. 5, Plant Protection Ltd. P. 6, Australian News and Information Bureau, London. Pp. 7 and 8, Office of High Commissioner for South Africa, London. Graph, p. 9, FAO.

Fish Culture in Conjunction with Rice Cultivation—1

W. H. SCHUSTER

Food and Agriculture Organisation

The cultivation of fish in rice fields has long been practised in the Far East, and the produce constitutes a not unimportant addition to the protein deficient dietaries of the inhabitants. This article describes and discusses the procedures employed in fish culture. It contains the substance of a paper presented to the meeting of the International Rice Commission recently in Tokyo. We are indebted to the Food and Agriculture Organisation of the United Nations for permission to publish it. Part 2 will appear in our February issue.

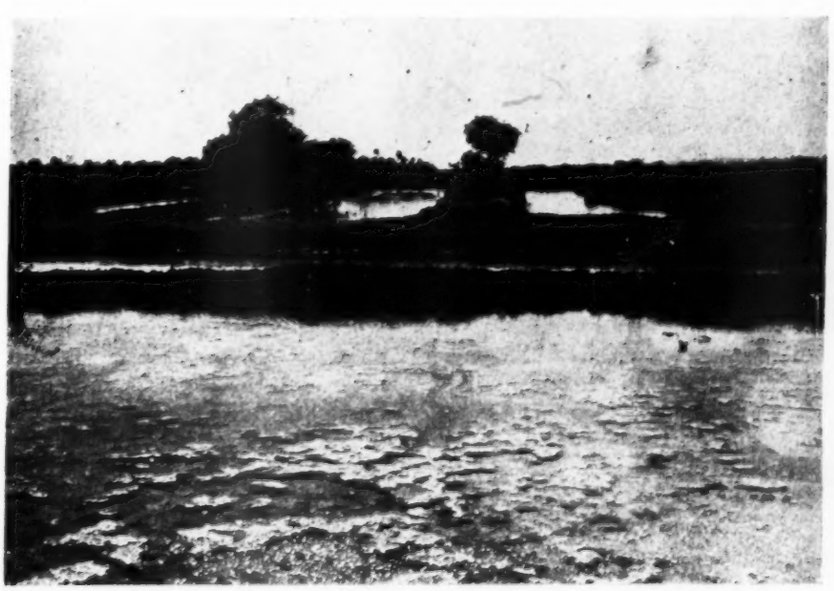
COMMERCIAL utilisation of rice fields for the cultivation of fish has been the subject of study by a small group of fishery biologists and agriculturists for more than 20 years. Their investigations have shown that, in addition to a normal crop of paddy, yields of fish varying from 100 to 800 kg. per hectare per annum can be attained. Recent research work has even disclosed that under certain circumstances fish culture has a favourable effect on the yields of rice. Since contemporaneous production of grain and animal protein on the same piece of land would be an almost ideal method of land usage, reports on progress in research are everywhere read with interest. All that is known at present on the subject seems to confirm that in practically every rice-producing country vast expanses of naturally or artificially irrigated rice fields could be utilised for fish culture if provision were made for practical vocational training and sound scientific management.

FAO, interested in the agricultural as well as the piscicultural aspects of the problem, has recognised the immense possibilities of this promising branch of inland fisheries. Since the most successful way to develop the exploitation of latent fisheries resources is to stimulate private enterprise, FAO, through its International Rice Commission, is advocating the extension of fish culture among rice farmers. In this essay, supporting information is compiled similar to that used in the conduct of extension work in rice-producing countries.

The main feature of fish culture in rice fields is the production of stocking material* in ponds and the subsequent rearing of that material in the fields until it becomes suitable for human consumption. There are great differences in the sizes at which fish is fit for consumption in various countries, depending on whether the standard of living is high or low. Fish of 10 to 15 cm. in length, which, unprocessed, are practically worthless in Europe or North America, have a ready sale in East Asia and Central America because, in areas where rice constitutes the staple diet, fresh or cured fresh-water fish is often the customary side dish to a plate of boiled or fried rice. Small wonder that it is easy to persuade a rice farmer to grow his beloved fish course side by side with his rice on his own piece of land.

Water supply in rice growing

In ' wet ' cultivation of rice, flooding of the fields can be effected in various ways. The simplest method is to build bunds round the fields in order to retain rain-water and, since the planting of rice thus depends on the onset of the rainy season, an irregular water supply may often cause crop failures. Some improvement can be brought



A brackish pond with floating algae at Djakarta, Indonesia. These ponds are dangerous as breeding places of malaria-carrying *Anopheles* mosquitoes

*This term ' stocking material ' signifies the eggs, fry, young fish or spawners which are brought into a body of water with which to stock it.

about by the construction of provisional devices for the distribution of water by each farmer individually, a system often applied in regions where rainfall is sufficient to raise a crop of rice without the need for a complete irrigation system.

Where water is scarce or where soil fertility permits two crops of rice a year, an adequate water supply can be ensured only by means of controlled irrigation. Systems comprising dams, reservoirs, canals, weirs and ditches are constructed out of funds from governmental sources, or on a co-operative basis by the farmers. The most efficient use of water can be secured in this way, and at the same time the risk of crop failures by drought is reduced to a minimum.

Whatever system is applied, the object is to flood the fields to a depth of 5 to 25 cm. for the period necessary for the rice crop to reach maturity. When rice is planted under well-controlled conditions of flooding, the cultivation methods entail wet tillage (puddling) of the soil, sowing or planting and flooding of the fields from the time of tillage until the paddy reaches maturity. Depending on the climate and the characteristics of the variety of rice grown, the fields are waterlogged for four to five months in tropical regions and for six months or even longer in sub-tropical climates.

The environmental conditions in rice fields

The first step in fish cultivation is to plant young fish, and in cultivating fish in rice fields this can be done either when the rice is growing or later after the paddy has been harvested. A layer of water 10 to 20 cm. deep might seem to offer a poor habitat for a dense stock of fish, but the size of a body of water is not the only thing which determines the growth rate of fish. In addition to size of the body of water, as signified by area and depth, nutrient content and physical properties of both soil and water, are factors of considerable importance; some species are modest in their demand for 'swimming space,' and for these the supply of natural feed is the key factor controlling production. Moreover, from the ecologist's viewpoint, flooded rice fields are an excellent habitat for freshwater fish. The warm and fertile water of the field provides a suitable environment for animal and vegetable micro - organisms which reproduce abundantly. With metabolism proceeding rapidly at temperatures such as are required for good growth of rice, the characteristics of the environment are decidedly favourable to the fish population.

There is a marked difference between conditions at higher altitudes and those in the lowlands so far as suitability for fish cultivation is concerned. Mountain regions in areas where rice cultivation is possible are generally exposed to heavy rainfall, and if the gradient of the terrain is steep the sites must be levelled and terraced to prevent erosion. The steep water courses of the uplands are inhabited naturally only by types of fish adapted to swift currents and if there is to be cultivation of fish, the carp and bream types of fish commonly used for this purpose must be transplanted there by man. Since most types of cultivated fish need stagnant water for good growth and reproduction, spawning ponds must be built before stocking of rice fields is possible.

Elevation

The Preanger highlands of Java, the Batak countries of Sumatra, the inland areas of Madagascar, the rice-producing parts of Nepal and the Thai countries of Indo-China are examples of regions where indigenous fish culture in combination with rice cultivation is practised. Between 20° north and south of the Equator the main fish culture region lies between 1,000 and 1,500 metres above sea level. In this zone, practically every well-irrigated rice field capable of being drained can be stocked with fish.

For tropical climates, the possibilities for successful cultivation of fish below 1,500 metres (450 ft.) are greatly restricted. At such levels, controlled stocking of rice fields can be replaced by rough release of cultivated species that will reproduce naturally under such conditions because artificial propagation and protection of stocks against predators are problems yet to be solved by fish culturists. Although the difficulties of fish culture in low levels are often attributed to high water temperatures and the resulting low oxygen concentrations, in fact it is the acidity of the water and the predominance of carnivorous fish which are responsible.

The swampy rice fields and marshes which are characteristic of coastal areas can be made productive even in a tropical climate. Since lack of drainage facilities impedes aeration and mineralisation of the soil, acid reaction of the water should be regarded as a constant feature. Under such conditions, air-breathing fish should be cultivated if artificial propagation of other types of fish should fail. The stocking of swampy rice fields with *Trichogaster pectoralis* is an example of a cultural system with limited control of the density of stocks; and the culture of carp-like fish in ponds and rice fields in Bengal and Tonkin are examples of the rearing of stock which do not reproduce in an artificial habitat.

Even brackish water areas, especially in deltaic regions, are used for rice culture, and here it is possible to cultivate also brackish-water species of fish in the rice fields. The cyprinoid, *Puntius javnicus*, is reared in the delta of the Beganwan River in Java, whilst mullets are reared in the impounded rice fields (bherries) of Bengal and Peneid prawns in rice fields of Malabar and Travancore.

Rainfall and temperature

As far as rainfall is concerned, fish culture lies within the same climatic zone as does indigenous rice cultivation. The minimum annual rainfall required for fish cultivation is about 1,200 mm. provided constant flooding of the fields is possible for a period of at least 90 days; 1,400 mm. of rain make things easier, and fish culturists do not object if the rainfall is 1,600 mm. and more.

In regard to temperature, observations in Java have disclosed that, at an altitude of 200 metres above sea level, the temperature of the water in rice fields may reach a maximum of 33°C. and a minimum of 23°C. The daily fluctuation is quite considerable at 200 metres; a temperature range of 10°C. has often been noted on days without rain, but at greater altitudes the range is less and maxima are lower. At the Equator, the average temperature of the water coincides roughly with the average air temperature, which falls 0.56°C. for every 100 metres increase in altitude. A daily thermal stratification of the water inverting during the night

has been observed. These data relate only to the Equatorial zone; the temperature pattern is rather different in the marginal regions of rice cultivation. Common carp—the fish most widely used for cultivation—possesses a high tolerance to temperature fluctuations. The Asian varieties of common carp can tolerate temperatures as high as 34°C. provided the oxygen content of the water is sufficient. When transplanted to Europe, these varieties have been found to be able to tolerate temperatures around freezing point. Temperatures below 19°C. retard growth, and the optimum seems to lie between 22° and 28°, depending on racial properties. The optimum temperature for European carp transplanted to tropical regions is about 18°C.

Tilapia, a fish which is rapidly gaining importance for cultivation in rice fields, grows well at temperatures above 20°C. Among the many species of the Tilapia group which are not yet used for cultivation purposes, there might be some which can thrive in cold water, but *Tilapia mossambica*, the most commonly bred species, thrives at 20°C. At 14°C., growth is retarded, and for good production the average temperature of the water should be 17°C. or higher.

Rice fields in Indonesia stocked with carp as a second crop

Social and economic aspects of fish culture

Rice cultivation is a labour-consuming industry. Mechanisation has so far been applied only on a very small scale and, since there is work for many, rice - producing areas are usually densely populated even in countries with a low general population rate. With practically all arable land under the plough there is little space left for pasture, and consequently cattle breeding seldom meets the demand for animal protein. Often the animal industry cannot produce enough draft cattle even to till the fields, and neither sheep nor poultry raising can meet the animal protein deficiency. In theory, the demand for fish could often be met from the catch of sea fish, but in practice in tropical countries the lack of adequate transportation and of refrigeration facilities makes distribution of fish difficult. Fish culture has the very great advantage that it makes fish available to areas far removed from the sea; and to this advantage may be added those which derive from the relative simplicity and cheapness of the operations, and from the high productivity which may be obtained from a practice whose extension is relatively unlimited at present.

The population density of rice-producing areas is in itself conducive to fish production. In many tropical countries it is customary to deposit human wastes in flowing or stagnant water, either merely for disposal or to use them as manure for the fields, ponds, tanks or reservoirs. It is estimated that in China, Japan or Indonesia more than 90% of the wastes are disposed of in this manner, with the result that in these countries waters downstream from population centres are extremely fertile and very valuable for the irrigation of fields. High water temperatures lead to rapid decomposition of organic matter in the wastes, giving a fertilising effect almost at once from which the fish quickly benefit.

The role of fish culture

In the more or less isolated farmers' community of a village in a rice-producing country in Asia, fish culture plays a role which is quite unlike the role it plays in other parts of the world. In Europe, cultivation of carp or trout is a scientifically managed branch of production conducted for profit just as any other industrial enterprise. In the U.S.A., fish is reared in thousands of farm ponds, but there the motives are mainly erosion control, sport and recreation. In China, Indo-China, Indonesia, Japan, Madagascar, Malaya, Taiwan and Thailand, fish culture is practised almost exclusively by farmers who seldom possess title to more than a comparatively small piece of land. The social importance of fish culture to these people can properly be understood only in relation to the economic standards and practices of these people. Asian fish culturists and farmers accept the risk that there will be no return for the effort which they expend, as long as the cash investment is redeemed. Usually, the cash investment is very small and profits ranging from 50% to 100% are not regarded as out of the ordinary. The low evaluation of manual labour is shown by low daily and hourly wages, but still more clearly in the poor selling value of fields and ponds which have been laid out without cash investment. The small landholder is accustomed to receiving only part of the cash as a reward for his work, and he readily seizes any opportunity to reduce the risk of receiving an inadequate reward for his efforts.

The programme of water-use

The poor hard-working farmer finds strength in his membership in the village community; in times of hardship he receives assistance from his

fellow villagers, and the ancient traditions of the village community are more strictly observed than administrative regulations. This is especially true in the case of rational use of irrigation water. Where a system of technical irrigation is adopted, the diversion of the available water over thousands of fields is a problem which can only be solved by common sense and with the recognition of mutual interests. Since water is the key feature in rice farming and its rational utilisation is a matter of concern to all, to minimise its loss is a problem of common interest, and before fish culture is initiated in an area the situation must be reviewed in the light of these factors. Experience has proved that the practice of damming water, as required for the successful cultivation of fish, leads to a slight increase in the loss of water. Greater depth does not mean more evaporation —the losses are caused by leakage and seepage, and these can be reduced by good maintenance of dykes or bunds. But even when increased consumption of water is inevitable the prospective production must be considered from the point of view of quality as well as from that of quantity before the idea of fish culture is abandoned. Common welfare will be most efficiently served by allocation of water to that branch of production which meets the most urgent need. If protein-containing food is scarce in an area, the interests of protein production should prevail. Moreover, the introduction of fish culture might be desirable, since better financial results can be expected from the production of easily saleable and comparatively expensive fish. In regard to rate of yield, broad fish trenches in rice fields may occasionally cause a slight decline in paddy production; in general, however, fish culture has a favourable effect on rice crops. Reports from Indonesia provide well-documented information concerning an increase in paddy production varying from 4% to 7.4%. Similar results are reported from Japan, China and India. Turning to the financial aspects of fish culture, it must be emphasised that in tropical regions fish can be cropped about once a month, while rice yields a crop only at four- to six-month intervals; this is a matter of importance to the low-income farmers who cultivate paddy.

Photos: FAO

The British Scheme for the Approval of Insecticides, Fungicides and Herbicides

At the inaugural meeting of the Pesticides Group of the Society of Chemical Industry held in the Royal Institution on October 18, the subject under consideration was the British scheme for the approval of insecticides, fungicides and herbicides, which has now been in successful operation since 1942. Various aspects of the scheme were dealt with in a series of papers. The scheme is, of course, a voluntary one and provides for the admission of proprietary preparations to a list approved by the Ministry of Agriculture after they have been examined and recommended for approval by an advisory panel. Applications for admission to the list have to be made by the proprietors of preparations, while inclusion in it is in effect a guarantee that preparations do, in fact, fulfil all that is claimed for them by the manufacturer.

The scheme has given entirely satisfactory results. Actually, the number of approved preparations is steadily increasing ; at present some 404 preparations are included in it. The main criticism of the scheme is that hitherto it has been inadequately publicised and that there is widespread ignorance of it and the benefits it can concur among those whom it is primarily intended to benefit, *viz.* actual growers, farmers and horticulturists in the United Kingdom.

At the meeting of the group, Prof. J. W. Munro, Emeritus Professor of Zoology and Entomology at the Imperial College of Science, described how the scheme came to be founded. He mentioned various preliminary steps taken towards the regulation and approval of pesticides in Great Britain, which included discussions so long ago as 1911 on a proposed Sales for Agricultural Purposes Bill. These were followed in 1920 by discussions on the subject between the Chamber of Horticulture and the Ministry of Agriculture. In 1931, the Council of Agriculture for England moved a resolution calling for legislation to regulate the sale of insecticides and fungicides. The discussion of this and subsequent proposals continued for a number of years, but nothing definite in the shape of action materialised until 1942, in which year the Ministry of Agriculture launched the present scheme, which aimed at the preparation of a list of insecticides and fungicides to be recommended by their brand names. Before concluding, Prof. Munro paid tribute to the many workers in laboratories and research stations who undertake the experimental work on which approval must be based and to the members of the Plant Pathology Laboratory who are responsible for co-ordinating their activities.

Dr. R. de B. Ashworth gave an account of the structure and operation of the scheme. He outlined the mechanism by which the Ministry is advised in the running of the scheme and described the functions of the advisory committee, the joint panel and the various individual panels responsible for drawing up the specifications upon which products are assessed for approval. He specially drew attention to the degree of co-operation achieved between scientists in industry, Government and research stations.

Mr. J. King, in a paper entitled ' The Role of the Government Chemist in the Administration of the Scheme,' commenced by historical references to the manner in which the Government Chemist's Department came to be set up. He particularly pointed out that pesticides were amongst the substances with which the department was concerned over a century ago. He emphasised that the Government Chemist's Department has had a representative on many of the panels under the scheme and that many of the specifications on which preparations are assessed depend upon the availability of satisfactory methods of analysis.

At the conclusion of the papers, Dr. R. A. E. Galley, chairman of the group, pointed out that during the coming session further papers will be read before the group on the work of the Approval Scheme ; a vote of thanks to the lecturers was proposed by Dr. E. T. Holmes and carried with acclamation.

It is hoped that the publicity given to the scheme at this meeting and also at the recent Weed Control Conference at Harrogate will lead to its becoming better known and appreciated.

The Possibilities of Increasing World Food Supplies—2

W. H. PAWLEY

Food and Agriculture Organisation

In this second part of Mr. Pawley's paper on increasing world food supplies, he discusses the possibilities of increasing crop yields. Part 1 appeared in our December issue.

IT is generally recognised that there are very substantial possibilities for increasing production from existing arable lands, but probably few people realise their full extent. In the following pages, an attempt is made to assess the contribution which improved techniques could make to crop yields if existing knowledge were generally applied.

Use and control of water

Irrigation as a means of bringing new areas under cultivation has been discussed in the previous section. But better control of soil moisture by supplementary irrigation or improved drainage can usually make a very substantial contribution to yields.

In humid and semi-humid regions, supplemental irrigation is receiving increasing attention, since even where the rainfall is generally considered to be adequate, a careful examination often reveals that some moisture deficiency is normal during some of the summer months. Even where moisture is adequate in all months, brief droughts may have serious effects, since intermittent water deficiencies greatly reduce crop yields.

Such supplemental irrigation has an important bearing on yields of many crops in the south-eastern United States. For instance, irrigation of cotton has more than tripled yields and in the case of tomatoes, beans and other vegetables two- and threefold increases have been obtained through supplemental irrigation. Cows on irrigated pastures in Tennessee have returned 43% more milk, while studies carried out on maize from 1946 to 1953 show an average increase of 25 bushels per acre from supplementary irrigation.[11] As a result, some 180,000 hectares are receiving supplementary irrigation in the United States. In Europe, also, farmers in increasing number are installing sprinkler systems. Nevertheless, the practice has so far been adopted by only a small proportion of farmers in humid and sub-humid regions.

In moist areas, drainage is an effective tool for increasing crop production. In the United States, some 20 to 25 million hectares have been added to the cultivable area by drainage, and production has been at least doubled on an additional 25 to 30 million hectares by improving drainage. According to Jones, 20% of the cultivated land in the humid sections of the United States still needs improvement in this respect.[12]

Improved drainage has been one of the major factors in increasing crop yields in Europe, especially northern Europe, but, as in the United States, extensive areas in north - western Europe still require improved drainage. Further east, particularly in Russia, better drainage is one of the major factors in land improvement.

Prof. W. G. Lowdermilk, an FAO soil conservation expert, examines elephant grass in Israel. Elephant grass has been found to grow in Israel throughout the dry season without irrigation

Building-up soil fertility

In recent decades, much publicity has been given to soil erosion and declining fertility. However, man has also frequently improved the fertility and productive capacity of the land that he has used. The soils of north-western Europe were originally of rather poor fertility, yet the use of lime to correct acidity, the return to the land of the manure from a dense livestock population, and the development of legume and grass rotations built up the fertility of the soils to a level much above that of the Middle Ages. With our present knowledge of plant nutrition and the ready availability of inorganic fertilisers poor soil fertility can no longer be accepted as automatically ruling out certain areas or condemning them to uses of low productivity. Any review of present fertility practices gives ample indication that the potentialities for increasing production through better soil management are tremendous.

The use of legumes and grasses to add nitrogen and humus to the soil has been characteristic of north-western European farming, but, elsewhere the development of good rotations has not progressed far. Rotations including grasses and legumes in the more humid parts of the mono-cultural cereal belts would raise yields. In Australia, leguminous pastures, together with trace elements, can build

up the productivity of extensive areas with good rainfall, but low natural fertility. This will ultimately bring tens of millions of hectares into a mixed farming system, but is as yet hardly beyond the pilot stage. Adapted grasses and legumes for grazing and green manuring will ultimately contribute greatly to the fertility of the northern podzols and the tropical latosols.

Manures and fertilisers

Farmyard manures and composts have done much to maintain soil fertility in north-western Europe and east-central Asia. In other parts of the world, manures are only partially utilised for agricultural purposes, while other sources of organic matter are little used. Shortages of fuel, transport costs and sanitary reasons are factors here, but ignorance and apathy bear a much larger share of the responsibility. Particularly great are the possibilities in the Far East, where the dense populations produce immense quantities of excreta and litter, labour costs are low and distances generally short. However, these materials are only very partially used except in Japan, Korea and China.

Taking the world as a whole, we have only begun to use the potentialities inherent in the chemical fertiliser industry. Thus in 1952-53, Europe, the United States, Canada and Japan used 8.7 million out of a total world consumption (except U.S.S.R.) of 9.6 million tons of nitrogen and potash. Together with Australia and New Zealand, they used 4.7 of a total of 6.1 million tons of phosphoric acid. Compared with a consumption of 6.6 million tons of nutrients (N and P_2O_5 and K_2O) in Europe and 5.3 million in the U.S.A., Asia (except Japan and former territories), with almost as great an area under cultivation as Europe and North America together, used less than 300,000 tons. Yet Japan, where the type of agriculture is basically the same as in the rest of Asia as far as West Pakistan, used 850,000 tons of nutrients on 5 million hectares of arable land.[13] The Near East (except Egypt), Africa and Latin America (with two or three exceptions) use only negligible quantities of fertilisers. Even in Europe, large potentialities exist for increasing production through greater application of fertilisers while remaining within economic limits.

It would, of course, require an enormous amount of detailed work to estimate the potential contribution which better soil fertility practices could make to agricultural production. It would, however, be a conservative estimate that with the exception of a very few countries, such as Japan and the Netherlands, production could be increased by at least 50% and in many parts of the world could be doubled, simply by the better and more intensive use of fertilisers, manures and legumes.

Plant breeding and seed improvement

It is the purpose of plant breeding to give farmers varieties with higher capacity to produce, or more resistant to certain diseases and pests and to extremes of weather.

Selection, which involves choosing the best of what already exists, and hybridisation, which involves the creation of new genetic combinations, offer tremendous opportunities for further increasing agricultural production. In the more advanced countries, further progress will probably come mainly from hybridisation. But in underdeveloped countries, hundreds of varieties of the basic food crops, some good, some bad, some indifferent, are in use by farmers and the scope for improvement by systematic testing, purification and concentration on a limited number of varieties is usually substantial. In the less developed regions very substantial gains could be obtained by the wider use of known improved varieties in areas for which they are suited.

One of the most obvious opportunities for increased production through plant breeding is given by hybrid maize, which in the United States has yielded on average 30% higher than other varieties. In most of the other maize-producing countries, little or none of this potential has been garnered, although some work has been done on breeding hybrids suited to local conditions, an essential preliminary.

Great opportunities exist for improvement of rice varieties, since in the Far East only Japan has made a systematic and comprehensive attempt to do this. Here, varietal improvement has made a major contribution to the yields, which are nearly three times the regional average. There is every reason to believe that plant breeding can give on the other 85 million hectares of rice in the Far East results comparable to that which it has given in Japan. Since 1949 the countries in monsoon Asia have been co-operating under FAO leadership in a project to cross the *japonica* and *indica* types of rice, with the aim of combining the responsiveness to fertilisers and high potential yield of the former with the adaptability of the latter to the environmental conditions of sub-tropical

Wheels turned by bullock are used to lift water from canal system to irrigate higher land in Bahawalpur State, West Pakistan

Asia. Similar opportunities exist for wheat and barley in the Near East region, where little varietal improvement has so far taken place, except through farmer selection. So far very little has been done to select and improve the indigenous varieties of sorghums and millets which provide a substantial part of the food supply in many areas of Africa and Asia.

Selection and breeding could do at least as much to raise yields and improve the quality of the food crops other than cereals (such as the various roots, pulses, fruits and vegetables of the peoples of the under-developed regions). In fact, it may well be that the scope for plant improvement is greater in these cases, since less attention has been paid to the improvement of the non-cereal food crops.

A student at the rice hybridisation project at Cuttack, in India, examines pollen and studies growth. The project is one of the activities of the International Rice Commission

Workers hoe rice growing on land reclaimed from Amazon-flooded jungle and now yielding first-class crops

Better equipment

The chief function of machinery is to make it possible for each man to do more work, not to make each acre grow more food. Nevertheless, improvements in equipment can make an appreciable contribution to raising crop yields, first by enabling operations to be performed better and secondly by making possible more timely operation. In many parts of the world the implements available to farmers are not adequate for the preparation of a good seed bed or for proper destruction of weeds. The substitution of the hoe for the planting stick or putting a steel point on the share of a wooden plough result in higher yields as well as easier work. In more advanced economies, improvements in plough design may enhance yields and improvements in equipment reduce losses during harvesting.

The element of timeliness is, of course, most important. For instance, in many places it is not possible to prepare the ground until the rains come and thereafter the interval before the crop must be sown may be very short, so that time does not permit of adequate preparation; or if rains are delayed the crop may have to be sown too late, thus reducing yields, Better equipment which makes it possible to work the ground more quickly or to commence preparations in advance of the rains, so that sowing can occur at the optimum time, may make a substantial difference to yields. Thus every mechanical improvement which makes it possible for a farmer to do his work more quickly gives him greater control over the elements.

Reducing losses caused by pests and diseases

Extremely large quantities of food and industrial crops are destroyed each year by diseases and pests. We are a long way from being able to make a blanket estimate of the extent of such losses, but they are certainly equivalent to the produce of many millions of hectares. Most of them could be prevented by the full application of present knowledge.

For the world as a whole, the gap between knowledge and practice is probably greater than ever before. In particular, there has been remarkable progress in chemical methods of control of pests and diseases of crops through chemicals, such as DDT and BHC. DDT has been largely responsible for an increase of over 100% in the yield of potatoes in the United States and remarkable increases have occurred in the yields of other vegetables and fruit trees since the advent of such chemicals. However, they are little used outside North America, Western Europe and a few other countries, and there is, therefore, a tremendous backlog of existing knowledge which could be drawn upon to reduce losses from pests and diseases.

Large quantities of food, particularly grains, fruits and vegetables, animal products and fish, are lost during storage and transport from pests and fungi. Only a small proportion of the world's population is served by modern methods of grain storage which can keep losses to a low rate, or by processing facilities which can avoid heavy seasonal losses. It is difficult to estimate such losses, but an FAO meeting in 1947 estimated losses of cereals at around 10% of

all stored grain. Losses are certainly much heavier in the tropics.

Inter-country comparisons of crop yields

The yields which have been achieved in the more advanced countries in a given branch of farming may often be taken, with due allowance for exceptionally favourable circumstances or levels of input which might not be economic elsewhere, as a rough measure of the possibilities in other parts where natural conditions are more or less the same. Obviously, such allowances can only be made imperfectly, but it is not difficult in many cases to hazard an informed guess as to whether better farming or a natural advantage is the principal element in yield differences. This judgment may be the more easily made where historical data are available on yield trends.

Rice in the Far East

One of the striking contrasts in the world agricultural picture is afforded by the differences in paddy yields in the various countries of monsoon Asia, with a range from about 4 tons per hectare in Japan to around 1 ton in India. Fairly high yields of around 3 tons and 2.5 tons per hectare are found in Korea and China. In other countries, they do not exceed 1.5 tons. Differences in climate may be a factor, since the three northern countries enjoy an east coast temperate as opposed to a tropical climate in southern Asia. The longer period of daylight during the growing season may be a factor in high yields.

On the other hand, there are extremely obvious reasons in farming practices for the differences. For instance, Japan uses 170 metric tons of plant nutrients in the form of inorganic fertilisers for every 1,000 hectares of crop land, while the rest of the Far East, other than Korea and Formosa, uses less than 1 ton, mostly on specialised export crops. Japan has 70% of its rice area under highly improved varieties and provides pure seed each year to 30% of the area under rice. No other country, outside former Japanese territories, has more than 10% to 15% under improved varieties and the proportion is mostly much smaller. Virtually the entire paddy area in Japan is under controlled irrigation, a much higher percentage than anywhere else. Finally, Japanese cultivation practices, including preparation of the land, planting and weeding, are on an exceptionally high standard.

The exceptional yields in Korea and China are also susceptible of a ready explanation. Korea obtained the benefits of Japanese methods, including cultivation practices, use of improved varieties and especially the intensive utilisation of organic and inorganic fertilisers. In China, the prevalence of irrigation, the intensive use of organic manures and the careful practices, along with a fairly high degree of farmer selection of varieties, may well be sufficient to account for the yields of 2.5 tons per hectare.

Naturally, one cannot say that these differences in farming practices account for the full difference in yields between the various countries, but it is evident that they could account for the differences and certainly are responsible for the major part of them. This conclusion finds strong support from the fact that in 1878, when records begin, Japanese yields were around 1.75 tons per hectare and were already rising.

Maize in one of the U.S. Department of Agriculture's experimental plots from which new hybrids are developed. The tassels on certain selected plants are bagged to collect their pollen

It is difficult, therefore, to avoid the conclusion that the production potential of the 87 million hectares of paddy land in monsoon Asia (only 3 million are in Japan) are tremendous, if comparable use were made of high-yielding varieties and fertilisers, if the abundant water supplies of southern Asia were harnessed and general cultural practices improved. Appreciably higher per hectare yields for paddy would make it possible to devote more area to alternative crops, including animal fodders. This is the road that must be taken if Asia is to achieve a more diversified agriculture and a more diversified diet.

Hybrid maize

Principally as a result of the use of hybrids, the average annual production of maize in the United States has increased from 53 million tons in 1934-38 to an average of 80 million tons over the five years 1949-53 on an area 12% smaller. The whole gain cannot be attributed to the superiority of the new varieties, since hybrids, requiring more plant nutrients, have deeply affected all farming practices, including particularly the level of fertiliser usage. But the fact is that the existence of the superior varieties has created both the opportunity for much higher yields and the stimulus for better farming.

Since the gain from 1.4 to 2.4 tons per hectare is mostly attributable to a clearly defined improvement in cultural practices, there is no reason to suppose that it cannot be repeated elsewhere. Technically, the opportunity exists and one can say with good reason that similar changes in farming practice would be likely to result in yields comparable to those found in the U.S. Such a development would mean an increase in world production of maize (ex-U.S.A.) from 60 to 130 million tons.

Wheat

Wheat yields range from an average of around ½ ton per hectare in underdeveloped countries to 3½ tons in a few countries of north-western Europe, with a world average of just over 1 ton per hectare. It seems not unlikely that, if wheat were normally sown as part of a soil-fertility building rotation, along with a system of mixed farming, taking full advantage of mineral fertilisers, using varieties bred for the higher

FAO has sent a team of experts to Saudi Arabia to advise on flood control and irrigation of dry land

yields possible under these conditions and with proper control of weeds, an average yield of 2 tons per hectare would be readily obtainable under conditions adapted to wheat at costs per bushel not greater than those now incurred.

Selected other crops

In the United States, pre-war potato yields of 7.8 tons per hectare were roughly comparable with those in Asia, Africa and Latin America. Within a period of 15 years, U.S. yields have been pushed up to 16 tons per hectare, largely as a result of better control of pests and diseases.[14] If yields in the three under-developed continents mentioned above were comparable with those now prevailing in the U.S.A., the production of potatoes in these three regions would exceed 35 million tons, as against present production of 15 million tons.

In sugar cane, average yields of around 5 tons of sugar per hectare harvested are obtained in Cuba and many other countries, 8.6 tons in Australia and 20 tons in Hawaii. In India and Pakistan, the yield is just over 2 tons per hectare. As in the case of rice in monsoon Asia, it is probable that differences in varieties, fertilisation, other cultural practices and processing techniques have more to do with these yields than differences in natural conditions.

Yields of cotton lint per hectare in the U.S.A. fluctuate between 3 or 3.5 quintals. In China, they come to about 2 quintals and in India 1. The average for Africa ex-Egypt is 1.3 and in Brazil is less than 2. A yield of 300 kg. per hectare is probably generally practicable under non-irrigation conditions, given good varieties and good cultural methods. This suggests that Asia and Africa could double their production from the existing area by improved practices.

Conclusion

The ' target ' yields quoted in these examples do not assume full application of technical knowledge, but take as a standard the achievement of the average farmer in some of the better countries. They suggest that by these standards the production of cereals and many other crops could be at least doubled or, alternatively, the present production could be obtained from half, or possibly less than half, of the present area. These conclusions assume costs per unit not higher than at present and undoubtedly average costs would be considerably lowered, while making immense areas of land available for alternative crops and pastures.

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Photos: United Nations, London, pp. 15, 17 (left). FAO, pp. 16, 17 (top), 19. United States Information Service, p. 18.

Secretary-General of South Pacific Commission

The South Pacific Commission has decided to appoint as its new Secretary-General, Dr. Ralph Clairon Bedell, Ph.D., M.A., who is at present serving in Washington as director of the Programme Development and Review Branch in the Division of International Education, United States Office of Education, Department of Health, Education and Welfare. In this capacity, he is responsible for recommending technical assistance programmes in education for 33 countries and dependent areas where such programmes have been established.

Dr. Bedell, who is 51, has had many years of administrative and financial experience in American universities, particularly in the fields of education, vocational training and sociology. He has taken an active part in the work of the Caribbean Commission and the West Indian Conference and has travelled widely in Canada, Mexico, Central and South America and the West Indies.

It is anticipated that Dr. Bedell will take up his new duties with the South Pacific Commission early in March 1955. Meanwhile, Mr. John Ryan, Deputy Secretary-General, has been appointed to act as Secretary-General in the interval between the departure of Sir Brian Freeston and Dr. Bedell's arrival.

The Development of Spraying Machinery

Part 3—Development

R. J. COURSHEE, B.Sc.

Part 3 of Mr. Courshee's article deals with the development of new types of spraying machinery. Parts 1 and 2 appeared in our issues for November and December last.

THE elementary principles described (*a*) to measure physically the characteristics of spray deposits which have been found suitable biologically and (*b*) to measure whether spraying machines are giving the deposits required have been recognised for a long time. Dutton in 1926 in a Michigan State Agricultural Experimental Station bulletin said, in effect, that ' dose and the distribution of that dose on the leaf are both important in determining the degree of control obtained.'

There is, therefore, nothing new in these ideas, but what is perhaps novel is that since chemical pest and disease control is beginning to be used on larger areas, or in countries where chemicals and water cannot be wasted, or where the margin of profit obtainable from the crop is so small that the greatest economy possible must be effected on all cultural operations, it is necessary to make the measurements of dose and cover quantitatively.

It is thought that such measurements will help in choosing spraying machines best suited to each purpose, once that purpose is adequately defined. If a suitable sprayer is not available, the measurements are important factors to be considered in making one.

Choosing a sprayer

Thus there are two ways of obtaining a spraying machine to cope with a problem. The first is to choose a suitable machine from the range available. There are probably few bad spraying machines on the market, but some are much more suitable than others for each job. The second way is to make a spraying machine to suit the purpose in hand and to incorporate in it the best standards available.

A simple example of the way in which the choice of equipment will influence the results obtained is the spraying of the vertical surface of a stack of stored food. This is sprayed usually with hydraulic nozzles which are moved by hand past the surface of the stack. Not all the spray lands in the stack and the fraction lost by rebounding will be influenced by the spray drop size, the nozzle throughput, the pressure used and the distance of the nozzle from the surface.

The work of Yeomans has shown that the fraction landing can be 90% of the total, but decreases to less than half this if either (*a*) the wrong nozzle is used or (*b*) a suitable nozzle is used wrongly. Recently, when examining a sprayer in the manner recommended for its use, it was found that as little as 8% of the spray landed where it was aimed and more than 90% was not landing where it was wanted. In this instance, study of the application achieved by the machine allows a suitable choice to be made and considerable economies achieved and also indicates the proper method of operating the sprayer.

In a similar way, attempts are being made to obtain solutions to more complex problems, including many of the variables mentioned in the first article in this series.

Principles involved

It is suggested that the following principles may be of assistance in deciding which spraying machine to buy or make. Firstly, choose the right type of application method, because, for example, if the wrong type is chosen the best possible development work cannot provide the best results.

Secondly, having chosen a method, make sure of obtaining a suitable appliance for using it. In the case of stored foodstuffs, knapsack sprayers are probably the only type of sprayer which can be used and the second step is to find suitable knapsack sprayers. The problem actually resolves itself into the choice of suitable nozzles which could be fitted to almost any knapsack sprayer.

Thirdly, accumulate evidence, either by qualitative observation or quantitative measurement, of (*a*) application machines as units or preferably (*b*) of the components essential to the performance of these machines. By this is meant, for example, that more information will be obtained by studying the fans used on mistblowers rather than by studying individual mistblowing machines and noting, as part of their performance, the characteristics of their fans. Pumps, nozzles, materials of construction are all examples of major components best studied individually initially.

An example

Each machine problem is a big one if all relevant factors are taken into account, but take as an example a case where an underleaf dose is required on a particular crop and circumstances permit the use of either a high-volume boom sprayer or a low-volume boom sprayer or a fixed-wing aeroplane. High-volume boom sprayers give some underleaf cover, but generally this is obtained from the very small drops of the spray and accordingly represents only a small dose. The same sprayer equipped with pendant nozzles spraying upwards from underneath the crop gives a larger underleaf cover and dose.

An aeroplane gives almost no underleaf cover when drift spraying, but a moderately good deposit when boom spraying; that is to say, when it is flying only a small height above the crop and the spray is driven through

it by the pressure wave supporting the aircraft. A low-volume boom sprayer employing an air blast to break up the spray and drive it into the crop also gives an underleaf cover as the crop leaves are moved by the air stream and the spray swirls round them. Additionally, (*a*) it has the inherent advantages of low-volume spraying over high-volume and (*b*) it avoids the disadvantages of aircraft spraying.

But we do not know at all how crop height, leaf density, drop size, air speed and air quantity separately or together affect the relative proportions of the spray which land on top of or underneath the leaves. This is an example of the sort of problem that ought to be studied first by the physical methods described, providing the required physical deposit for the relevant crop and weather conditions have been previously determined and the economic necessity for such detailed study can be proved.

Biological assay is the most important but also the last measurement to make of a spraying machine's performance, since the results depend not only upon the sprayer, but also upon the chemical used and on previous biological work defining the performance needed. If the control is found to be inadequate, it is customary to say that the chemical is no use without anything like sufficient regard for the way in which it has been applied.

Types of spraying machine

A common fault also is to use the wrong type of machine and then to say it is a bad machine, whereas it is probably a good one for its proper purpose. Table 1 is a descriptive list of types of machine classified according to their function, which may be more useful than the conventional classification of machines according to their size.

A broad distinction must be made between sprayers for applying a deposit to a surface and those for space spraying. One cannot do the job of the other, although one or two machines are on the borderline and can do parts of both jobs.

Using surface sprayers, the spray is either aimed at the target—placement sprayers—or allowed to drift with the wind—drift sprayers. There are rather rare examples (confined principally to aircraft spraying) when both placement and drift methods are used with advantage simultaneously.

TABLE 1

A CLASSIFICATION OF SPRAYING MACHINES

Placement		*Drift*	*Combined placement and drift*	*Space*
Automatic	*Manually aimed*			
e.g. Boom sprayers for ground crops Mast sprayers for tree crops	*e.g.* Knapsack sprayers Hand lance spraying	*e.g.* High-altitude aircraft spraying	*e.g.* Low-altitude aircraft spraying Helicopter spraying Mistblowers	*e.g.* Aerosol generators Fogging machines

With placement machines, the spray is either directed by hand towards the target or the output is fixed at the beginning of the work and no regard is taken of variations in crop habit.

It will be realised what a bare skeleton of a classification this is (although it is complete) when hand-aimed sprayers include hand syringes, knapsack sprayers, paint gun sprayers, high-volume lance sprayers and hand-aimed mistblowers. The last, which is not a widely developed field yet, includes small knapsack, wheelbarrow, tractor-mounted and trailer-mounted models embodying a variety of shapes, sizes and costs.

Purposes of various types

A space sprayer is designed to produce a fine or a coarse aerosol for special purposes like impacting upon insects in flight; reaching inaccessible corners of warehouses; penetrating granular material to a small depth. Since the spray eventually lands, space spraying is an incorrect term, but it is commonly used and understood for the work of aerosol bombs and thermal and mechanical aerosol generators.

Drift spraying is designed to spread a spray cloud down wind so that a wide band 10 to a few hundred yards wide is sprayed in each passage of the machine. Speed is the keynote, but the deposit is patchy (badly underdosed areas may be feet or even yards in extent) and is confined to the upper side of horizontal surfaces and the windward side of vertical ones. If drops having small terminal velocities are used, some eddying occurs and deposits are found on the leeward side of small obstacles.

Placement spraying applies a deposit by aiming the spray at the target. On

Fig. 1. An experimental tree sprayer made for the Ministry of Agriculture

Fig. 2. An experimental ground crop sprayer made for the Sudan Government to apply ¼ to 1 gal. per acre of 20% DDT in oil. Figs. 1 and 2 show two very large sprayers made using the principles described in this series of articles. Attempts are now being made to apply them also to small and low-priced machines

some targets, the distribution formed by the machine is preserved faithfully on the target. On others, the wind takes hold of the spray and spreads it randomly, but the underdosed areas are then generally small in extent—a leaf here and there—compared with those formed in drift spraying. Economy of materials and efficiency of control by uniform distribution are the aims whether placement spraying is done with a knapsack sprayer or an aeroplane flying just above the crop.

Study of components

A second line of approach is concerned with a study of the components common to a variety of machines. Nozzles (WORLD CROPS, August 1953) are a large part of this work but other items can be examined alone and the results applied to a wide variety of machines. Pumps are an example. It is well known that gear pumps are quickly worn by abrasive materials, whereas plunger pumps are not. On the other hand, gear pumps are low in cost, are self-priming and work at high speed; therefore, it is desirable to use them in circumstances where they are not abraded, and we need to find the limit to the conditions where they are useful. Valveless pumps, without moving parts in the spray liquid, are also potentially very useful, but we know very little of their wear resistance.

Fans for mistblowing are of special concern, since they determine the fineness of the spray obtained from certain nozzles and also control the range to which an aimed jet can be projected. Air momentum or air kinetic energy may be predominantly important in different circumstances. Increased jet stability increases the range attainable, but lowers the likelihood of obtaining a uniform dose through the tree. The right fan, nozzles and pump for a particular purpose can be fitted on to any one of a dozen mistblowers. So it is the truth, but a long way from the whole truth, to say that a spraying machine is a tank, pump and a set of nozzles on a pair of wheels.

Conclusions

In conclusion, it may be repeated that the whole job can best be solved by teamwork, but the problem should be broken up into its component parts and the solutions to each then reunited. The individuals responsible for each part of the work should also be a united team closely concerned with and in touch with each other's work.

The engineer's part in designing application machinery is directed to obtaining from the biologists information on the precise duty a machine is required to perform and then to measure which of the different types of machine available best fill the bill. It is basic work equally applicable to spraying machines of all sorts and it is hoped that this account will help people who have spraying machinery problems towards a route by which they may find answers to them.

Photos: National Institute of Agricultural Engineering.

Dr. J. B. Hutchinson's Tour

Dr. J. B. Hutchinson, C.M.G., F.R.S., director of the Empire Cotton Growing Corporation's cotton research station at Namulonge in Uganda, returned to England on November 6 from a 10-week tour in the United States. Dr. Hutchinson, who has worked for nearly 30 years on the genetics of cotton in the West Indies, India, the Sudan and Uganda, visited America at the invitation of the University of North Carolina to deliver a course of lectures.

The United States Department of Agriculture arranged a tour of some 5,000 miles, which took Dr. Hutchinson through the American cotton belt from coast to coast and enabled him to visit and exchange information with many of the major cotton research stations there.

Dr. Hutchinson was to leave London Airport on December 5 for Khartoum, where he was to spend a few days with members of the Corporation's team of cotton research workers before returning to Uganda in time for the annual meeting of the advisory board of the cotton research station. This meeting will be attended by representatives of a number of the cotton-growing territories who are partners in the work of the station and by Sir Geoffrey Clay, the Agricultural Adviser to the Secretary of State for the Colonies.

The Growing of Canning Beans in Tanganyika

J. K. ROBERTSON

Department of Agriculture, Tanganyika

During the past few years a not unimportant trade has developed in British East Africa in growing white haricot beans for canning. From Tanganyika in particular exports have increased considerably in the past five years. The position in this territory is described and discussed below.

IN Tanganyika, the earliest efforts in growing beans for the canning trade appear to have been made by Mr. A. Kuenzler, of the firm of Arusha Ltd., as far back as 1937, when trial lots of beans grown by him in Arusha district were shipped to Europe for sale to firms engaged in the canning trade. Production in Tanganyika necessarily remained on a small scale for the next few years and it was not until the early years of World War II that the possibility of growing beans in Tanganyika for meeting the requirements of the canning trade in Britain was seriously taken up. Seed bean growing was, of course, already well established, the pioneers in this being Mr. F. J. Anderson, of Rasharasha Estate, Mr. L. A. Bennett, of Tarosero Estate, and Mr. A. Kuenzler, of Arusha Ltd., but as growers of seed beans seemed to be fairly well occupied in that particular business it was decided to ask African growers to produce these canning-type beans on the scale required by the British market.

Africans, of course, have long been accustomed to grow dwarf beans for their own consumption and for sale, but when it came to persuading the African to grow these small-size white beans as a cash crop the African showed his traditional conservativeness and indicated only too well that he much preferred to go on producing the larger-sized bush beans (*Maharage*) that he had been growing for many years. Several hundreds of tons of white-seeded haricot-type beans were distributed to African growers chiefly in Moshi district and to the Waha in Kasulu and Kibondo districts of Western Province, who have been accustomed to growing beans for sale for a long time, but both the Wachagga and the Waha displayed little interest in the new cash crop offered to them and it is safe to say that little of this seed now remains.

Meantime, the European seed-growers continued to plant some of the so-called ' haricot-type ' beans, since they found that if these beans were properly cleaned and graded and all defective beans removed there was a very definite demand for the new crop. Registered seed-growers soon found that they themselves could not grow on their own land the vast quantities required, so the system of sub-contractors which was already established in the growing of seed beans was used in the growing of canning beans also. In this system, farmers enter into contracts with registered seed-growers to plant certain quantities of beans at a contract price, the seed being supplied free to the farmer. The cleaning and grading of the beans is generally done by registered seed-growers, since few farmers are prepared to install expensive seed-cleaning equipment to deal only with their own crops. Recently, several firms in Arusha have installed seed-cleaning machinery purely for dealing with either the seed beans or commodity beans grown by farmers, so that the small-scale growers can export the crop themselves if they wish to do so rather than act as sub-contractors to exporters.

Culture

The increase in demand for both seed beans and commodity beans has been a most welcome trend in Northern Province agriculture, since beans form a valuable rotation crop and allow the farmer to get away from monocrop maize farming. Whereas maize is best sown in February and March just before the main rains set in, bush beans do best if sown in the latter part of the rainy season.

Planting, if on a large scale, is usually

A field of white haricot beans

done with bean planters specially made for the job, which can plant single seeds at accurate spacings. The commonest spacing between plants in the row is 6 in., while the distance between rows varies from 18 to 24 in. The wider spacing is recommended where tractors are required to pass through the growing crop. Single rows have been customary in the past, but the practice of sowing the rows at closer spacing and then missing a row where the tractor wheels pass has been suggested. If maximum yields are hoped for, weeding should be done up till the time the pods start to form, although weed growth after that is not considered to reduce the crop.

Pests and diseases

Just as in the growing of seed beans, the sowing of seed from plants that have been inspected during the growing season and which apparently are free from seed-borne diseases is most essential if maximum yields are to be obtained. The three important seed-borne diseases are anthracnose, halo or bacterial blight and mosaic; full descriptions of these and methods of control are given in Pamphlet No. 15 of the Tanganyika Department of Agriculture, written by Dr. G. B. Wallace, plant pathologist. One advantage of growing white haricot beans is that they are highly resistant to bacterial blight.

A careful watch for outbreaks of disease or the presence of insect pests should be kept on the crop during the growing season, since timely spraying against insect pests may mean all the difference between a good crop and a crop scarcely worth harvesting. If an outbreak of disease does occur, it is wise to keep people from walking through diseased areas and then on to clean areas, since disease can be spread to clean areas in this way. Insect pests recorded in Northern Province have been American bollworm (*Heliothis armigera*) feeding mainly on the pods, a looper-type caterpillar (*Phytometra orichalcea*) feeding chiefly on the leaves, and a sucking bug (*Acanthomia horrida*) which caused a good deal of damage to seed bean crops in 1952.

In one particular outbreak of American bollworm in a field of seed beans in 1952, since the passage of tractors and sprayers would have caused much damage to the standing crop, aerial spraying with DDT was carried out; this was most effective and certainly saved the remainder of the crop on this particular estate.

Harvesting haricot beans

Harvesting

Harvesting of large areas of beans is best done by an all-crop harvester, smaller acreages being dealt with by wind-rowing the crop and then threshing this with a combine-harvester, although this latter method can result in much loss by shattering. Harvesting is best done in the mornings or on cool, dull days, since losses by shedding can be heavy if the crop is harvested in hot sunny weather. Yields of white haricot beans in Arusha district average three to five bags (of 200 lb. each) per acre as harvested from the field, but yields of up to 1 ton per acre have been recorded, although such yields are rare.

Seed cleaning

The crop as harvested from the field is best fumigated straight away and then put through seed-cleaning machinery as and when this is available. In the past, fumigation has been done mainly with carbon bisulphide, but, as this does not kill any insect eggs which have not yet hatched, a double fumigation is necessary. Methyl bromide, which kills all stages of the insect as well as unhatched eggs, requires one fumigation only and, although it is dangerous material to handle, it should not be beyond the capacity of seed-cleaning firms to use it successfully.

Complaints from buyers regarding East African haricots have been confined mainly to damage by bruchid beetles, since a few damaged beans in a sample render it unacceptable to buyers. The adult bruchid beetle lays its eggs while the crop is still in the field; the young grub enters the bean, develops there and eats its way up to the transparent seed coat before pupating. This is the so-called 'window stage,' the adult beetle breaking the 'window' to emerge and start its life cycle anew. Fumigation properly carried out should result in the beans being completely insect-free, but there remains the problem of reinfestation in the holds of ships when the crop is being delivered to overseas buyers. Dusting the beans with insecticide before shipment has been suggested, although some buyers have complained of the excessive amounts of insecticidal dust used. Also it has not been easy to find a suitable dust, since the use of DDT is virtually prohibited where the beans are being used for human consumption and commercial BHC preparations impart a taint to the beans that persists long after the dust has been removed. Recently, lindane dusts made by Imperial Chemical Industries have become available in commercial quantities and as they impart no taint their use for dusting food beans is recommended. A range of lindane-impregnated dusts is prepared by East African Industries, Nairobi. Haricot beans are usually 'polished' with a

Field winnowing and drying the beans

talc preparation, one of those recommended being a proprietary product called ' Levilite.' This material is also stated to reduce insect attack.

To overcome the problem of re-infestation of beans in ships' holds, the use of paper-lined sacks has been recommended (the paper being impregnated with insecticide) and already one exporter has used this method. Since the normal practice is to export haricots in double bags, Mr. A. J. Jones, entomologist, has suggested that the inner bag used should be a paper one, impregnated with a suitable insecticide; this would be cheaper than using two jute gunnies.

Grading haricot beans

Some idea of the importance of the problem of insect damage can be gleaned from the fact that if this hazard could be removed there is stated to be a potential market in the United Kingdom alone for 35,000 tons of haricot-type beans annually.

Varieties

The main varieties grown in the past have been Comtesse de Chambord (rice bean) and Cambridge Countess, although numerous varieties or strains of varieties are now available. Japanese Ohtenashi, the variety most sought after by United Kingdom canners, is not yet grown in East Africa.

To achieve the best results, it is essential to keep varieties and even strains of varieties separate, since different strains usually have different rates of absorbing water and as soaking is the first process in the canning of beans (after they have been cleaned) it is a most important point: beans that have been soaked too long tend to disintegrate, while those that have not been soaked long enough will obviously be unacceptable. Obviously the need is for all the beans in a given sample to absorb water at more or less the same rate.

Exports

Separate figures of exports of haricots in the early years of the industry are not available, but the following figures give some indication of the extent of the industry in the Northern Province:

Year	*Exports in tons*
1949	252
1950	2,029
1951	2,005
1952	2,553
1953	1,714

Future possibilities

The growing of white haricot beans for the canning trade and for sale as dry-shell beans has been eagerly welcomed by farmers in the Northern Province and, provided that adequate precautions are taken to ensure that the beans sold come up to sufficiently high standards, there is no reason why production should not expand considerably. The first requisite is that the beans delivered shall be free of insect pests and of insect-damaged beans; the second is that seed of pure strains be grown instead of a mixture of strains or types which is put on the market by many growers. As an indication of the value of growing pure strains it may be mentioned that unselected haricots as sold by growers in 1953 in Arusha district were being sold with difficulty at Shs. 40s. per bag of 200 lb., while pure-strain white haricots were fetching up to Shs. 80s. per bag, according to the variety grown. Legislation to prevent the export of unsatisfactory consignments of beans has been suggested and is still under discussion.

Acknowledgment

I am indebted to Dr. G. B. Wallace, plant pathologist, and Mr. A. J. Jones, entomologist, for helpful advice and criticism.

To Authors and Readers

The publishers of WORLD CROPS invite the submission of manuscripts of books to be considered for publication. All manuscripts will be promptly acknowledged and carefully considered by qualified experts. A synopsis with chapter headings should be sent in the first instance, addressed to the Book Production Manager.

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The Smithfield and Agricultural Machinery Show

ON Monday, December 6, the 1954 Smithfield Show was opened to the public and continued its career until the afternoon of Friday, December 10, when it finally closed. 1954 is the sixth year in which the show has been organised in its post-war guise of a combined display of fat livestock and agricultural machinery. Each year since 1950 it has been held in this somewhat curious hybrid form, and each year it has achieved an increasing measure of success, which effectively gave the lie to those prophets of evil who at the outset could see no future for a display of this sort; the aim throughout has been, so to say, to make the best of both worlds and at one and the same time to help to revive the fortunes of the British livestock industry after the trials and tribulations of the last world war, and to give an impetus to the young and expanding British agricultural machinery industry.

Both aims have been so triumphantly fulfilled that today the future of the show seems to be threatened by the magnitude of the success it has achieved. It may be remembered that when we reviewed the 1953 exhibition in WORLD CROPS we expressed some doubts whether the present fertile union could for long continue for the simple physical reason of lack of space to accommodate all the exhibits on one site.

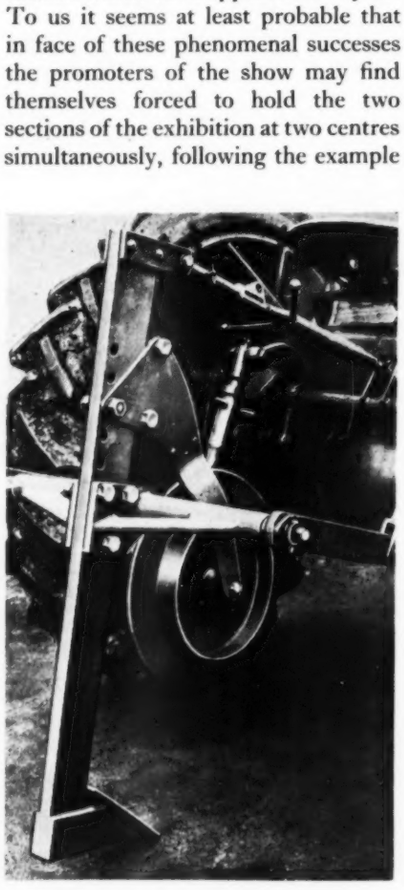
This year the result gives ample reason to pose the same query with redoubled force, for on this occasion the organisers have found themselves compelled to restrict the livestock entries notwithstanding that a new annexe to the carcase section has been erected and that certain classes for livestock have been drastically reduced. As it was in the cattle classes, the rule had to be made that only one exhibit could be accepted from each exhibitor; the total number of entries of cattle accepted amounted to 369—17 more than in 1953—nevertheless, the total number of entries applied for was 435, 66 entries having to be declined simply for lack of space to show them. Total entries on the livestock side included, in addition to 369 cattle, 471 sheep and 378 pigs, a total of more than 1,300 animals, representing the highest quality in the world, while special carcase entries numbered 72 cattle, 142 sheep and 215 pigs.

Somewhat similar remarks apply with even greater force to the machinery display, which is the reflection of the amazing developments which have taken place in the past few years and which are still continuing. Thus in the first nine months of 1954 export figures for British agricultural machinery showed increases over the corresponding figures for the previous year of £6 million in tractors and £500,000 in other agricultural machinery, while the total output is running at well over £100 million per annum.

The result is seen in the great demands for space in the machinery section which have appeared this year. To us it seems at least probable that in face of these phenomenal successes the promoters of the show may find themselves forced to hold the two sections of the exhibition at two centres simultaneously, following the example of the British Industries Fair in past years.

Attendances at the exhibition this year were slightly lower than for the last show but during the five days of its duration nearly 66,000 people passed the turnstiles. Visitors included many from foreign countries in all parts of the world as well as from the various countries of the British Commonwealth.

An account of some of the more striking features of the machinery section is given below.



The David Brown power ripper and subsoiler

Machinery and equipment

David Brown introduced a new device, known as the David Brown traction control unit, which is said to give the complete answer to wheelspin without the use of wheel weights, ballast, wheel strakes or oversize tyres. This is achieved by the simple adjustment of a hand lever, which transfers weight from the mounted implement to the rear wheels of the tractor, thereby giving the extra grip required to overcome wheel slip in bad conditions. At the same time, implement depth is maintained through the normal depth control wheel. The unit comprises a small adjustable valve which is built into the hydraulic system of the tractor. It will be included at no extra cost in the standard specification of David Brown wheeled tractors supplied after the Smithfield Show. Another new exhibit was the David Brown two/three-furrow mounted disc plough, designed primarily, although not exclusively, for export. Also new was the David Brown power ripper and subsoiler, which is stated to be capable of operating at depths varying from 12 to 20 in. A full range of tractors and implements was also exhibited.

The ' Spraymobile,' a self-propelled mechanised sprayer, was shown at Smithfield for the first time by the **Four Oaks Spraying Machine Co. Ltd.** This machine is self-propelled by means of a Villiers four-stroke engine, the same engine being used to operate the pump. A three-speed gear box, with clutch and free-wheel, is fitted as standard, enabling the machine to be used under the most diffi-

cult conditions and on steep slopes. The folding spray boom is adjustable for height and can be used as a horizontal boom or as vertical booms spraying outwards from each side of the machine. The normal working pressure is from 50 to 100 p.s.i., and the pump is capable of supplying from one to four spraying lances.

New equipment shown by **Mitchell, Colman and Co. Ltd.** included the 'Petkus' scourer, the 'Protector' chemical dresser unit, the NA model of the 'Petkus' seed cleaner and grader and the new British model of the M.C. 'Yeoman' pre-cleaner. The latter was shown for the first time at the show. The new standard model incorporates an intake hopper equipped with deflector fins and it is fitted with internal lighting inside the ventilation shaft. Various extra items are now available with this machine, including a stand, dust outlet bends, reject chutes, and final two-way bagging-off arrangement. The 'Petkus' scourer has been designed for fitting to the already well-known seed cleaner and grader. It is a compact unit which fits on the intake hopper of the cleaner and is used for clipping oats and for removing the awns from barley.

The exhibits of **Kenneth Hudson and Son** included a two-furrow mounted disc plough, a multi-row beet topper, the 'Down the Row' thinner, a twin-disc hoe, a Hudson-Colquhoun tractor-mounted capstan and a Hudson-Timmis potato harvester.

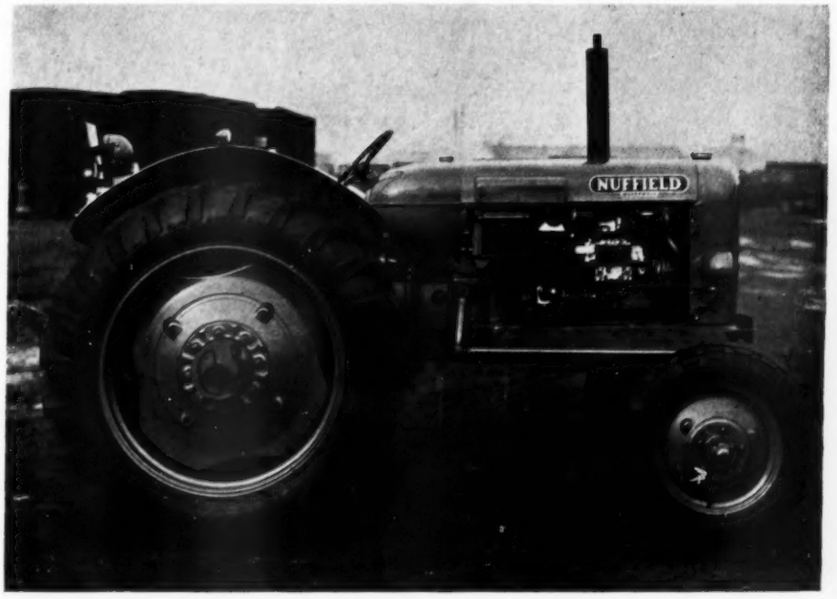
The **Villiers Engineering Co. Ltd.** showed its complete range of two-stroke and four-stroke units. The two-stroke range comprises eight models with capacities from 70 c.c. to 353 c.c. and power ratings running from .55 b.h.p. to 4 b.h.p., and the six basic four-stroke engines have capacities ranging from 98 c.c. to 395 c.c., the smallest developing .75 b.h.p. at 1,500 r.p.m. and the largest 4¼ b.h.p. at 2,150 r.p.m. In addition to these basic models, the company showed four-strokes fitted with kick-starters for use in positions in which the normal rope and pulley starting is impossible.

The B.M.C. 3.4-litre diesel engine was to be seen on the **Nuffield** stand in sectioned form, together with a working sectioned tractor. Also on view was a wide range of models with a diversity of specifications to suit every type of demand from all over the world.

A 'Spraymobile' at work

The new Wolseley all-purpose elevator was shown at the show for the first time by the **Wolseley Sheep Shearing Machine Co. Ltd.** This elevator is claimed to solve the problem of handling both bulk and unit loads without special attachments for types of load, and without sacrificing mobility or range. It is of all-steel construction, with total weight of 13 cwt. Although it has a carrying capacity of 6 cwt., it can still be moved over ordinary ground by one man. The elevator incorporates a composite conveyor belt comprising a pre-stretched cable chain, steel slats and canvas trays. The delivery height is easily adjusted by hand from 7 ft. 6 in. to 19 ft., and this can be done while the machine is running if necessary.

The **B.S.A. Co. Ltd.** showed its range of power units—120 c.c., 320 c.c. and 420 c.c.—which can be used for a wide variety of agricultural and horticultural equipment. The Model C, 120 c.c., develops 2 b.h.p. at 3,000 r.p.m. and has a weight of 50 lb. Model F, 320 c.c., develops 4.75 b.h.p. at 2,200 r.p.m. and weighs 95 lb., while the 420-c.c. unit (Model G) develops 5.75 b.h.p. at 2,200 r.p.m. and weighs 96 lb. The units can



The Nuffield 'Universal' tractor with B.M.C. 3.4 diesel engine

operate on either petrol, vaporising oil or kerosene, but outputs on vaporising oil and kerosene are slightly lower. The engines are of the air-cooled, single-cylinder, four-stroke, side-valve type, with ' Solex ' carburettor and automatic choke on F and G models. Model C has an ' Amal ' carburettor. The power units are started by either rope and pulley or handle, while a kick-starter mechanism is now available for the 120-c.c. engine.

A wide range of equipment was shown by **E. Allman and Co. Ltd.,** including the Universal Model ' 100 ' sprayer, the ' Sprayall 50 ' acid and field sprayer and the portable sprayer and pumping unit. The ' 100 ' sprayer is of 100-gal. capacity with a galvanised tank. It can be tractor or trailer mounted and has a G.45 ' Rollervane ' pump with pressures up to 300 p.s.i., according to size of jets. The spraying width of the three-part boom is 20 ft. and 30 ft., and when fitted with wide-angle jets 48 ft. for applying insecticides and liquid fertilisers. The ' Sprayall 50 ' is a tractor-mounted low/medium and acid sprayer with 50-gal. capacity brass tank and special R.V.10 ' Rollervane ' pump. The new three-part boom is made of angle iron carrying three copper booms. The portable sprayer and pumping unit is a versatile sprayer for crops, cattle and buildings, pumping water, washing down tractors and implements.

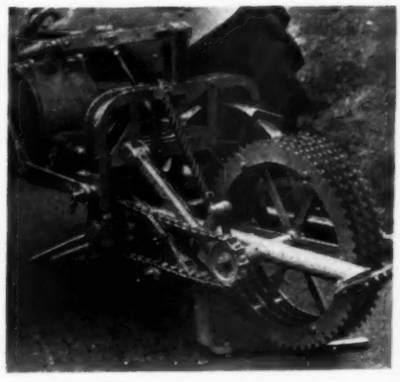
Massey - Harris - Ferguson Ltd. had a wide variety of exhibits on their stand, including tractors, hammer-mills, combines and implements. New implements included a rowcrop thinning machine, a single-row topper, a side-delivery rake, swath turner and tedder, and a fertiliser attachment for the Ferguson potato planter. The single-row topper is one-man operated and tractor-mounted by Ferguson three-point linkage. The implement employs the new Ferguson principle of differential topping, which ensures that each beet is topped with constant accuracy irrespective of size. A special linkage arrangement enables the topping knife to cut in a horizontal plane.

New models on show on the stand of **Cooper, Pegler and Co. Ltd.** included the ' X ' power sprayers, the ' Vitiver ' and the ' Toxaver.' The ' X ' sprayers are a new series of twin-piston pumps having a range of outputs between $3\frac{1}{2}$ gal. per min. (210 g.p.h.) and $8\frac{3}{4}$ gal. per min. (525 g.p.h.) at pressures from 227 to 427 p.s.i. All tanks are of brass, with capacities from 44 to 178 gal. The ' Vitiver ' is a powerful unit for charging batteries of pneumatic knapsack sprayers, both with air and liquid. Six sprayers can be charged simultaneously with liquid to a combined air and liquid pressure of 170 p.s.i. in just over two minutes. The ' Toxaver ' power duster embodies special features suggested by users at home and abroad. Output can be regulated up to 250 lb. of powder per hour. It is available either as a wheelbarrow model or on a stretcher to be carried by two men.

The Allman ' Genimec ' model ' 40 ' low medium-volume sprayer

In addition to its usual range of agricultural machinery, the **Harvester Saver and Implement Co. Ltd.** showed a new range of tractor drawbars. The company states that the success of the Russell adaptable drawbar—originally developed for the standard Fordson—has created a demand for similar drawbars to fit other tractors. These are now available for the most popular makes. Each one is fitted with a special self-locking pin for use with the vertical bar. This is to ensure that the correct height adjustment can be instantly set for each implement and to completely eliminate the necessity for a shackle.

Besides its usual wide range of farm machinery, **Ransomes, Sims and Jefferies Ltd.** showed its new range of ' Cropguard ' sprayers. The ' Cropguard Junior ' is a new sprayer for the smaller farmer which will cope with all low-volume spray applications. Applications are from 5 to 20 gal. per acre at 4 m.p.h. The ' Cropguard Standard ' is of similar design, but, being equipped with a larger pump, larger tank and longer booms, is suitable for farmers with larger acreages. It will cope with low- and medium-volume applications of practically all modern spray materials. Applications are from 5 to 35 gal. per acre at 4 m.p.h. Another new machine on show, the C.68 toolbar, was designed as a result of demands from an agent in the Sudan who was also the Fordson distributor in the area. It was originally planned to be a multiple ridger suitable for use with and for the hydraulic power of the Fordson tractor. The machines which went to the Sudan



The Ferguson single-row beet topper

The ' Bristol ' tractor, model D.52, fitted with Perkins P.3 diesel engine with 52-in. track centres and fitted with 10-in. plates

were equipped with 11-ft. single square bar, eight cultivating tines in front and five ridging bodies behind. The machine was also equipped with dropper attachment and marker attachment and with it, it was capable of riding about 50 feddans per day. The basic implement, comprising headstock, hitch adaptor and pneumatic depth wheels, has been further developed since the original machines were sent to the Sudan and it will be possible to fit the machines with varying sizes of square bars with cultivating tines only or various ridging bodies and disc ridger attachment with eight or 10 discs.

The ' Pulpall ' pulping and mincing machine was shown by **Opancol Ltd.** This machine is also a small hammer-mill after making a few minor adjustments. The machine stands on a tripod and consists of a rotary plate on to which three rotary knives are fixed on the circumference of the rotor, while a mixing blade is rotating in the middle. The casing has fixed shredding knives on its side and at the outlet there is an adjustable shredding gate which provides for various degrees of shredding. When this gate is in its highest position, the action of the machine is that of cutting up the material, while if it is fully lowered the material has to pass through small apertures and will consequently be finally pulped. When using the machine as a hammer-mill, the shredding knife is removed and replaced with a special screen according to the fineness of grinding required. The ' Pulpall ' has an output of up to 5 tons per hour when used for the pulping of roots, and as a hammer-mill it has an output of up to 3½ cwt., depending on the screen used.

Among the machines shown by **Jack Olding and Co. Ltd.** was the Boby ' Cleenestol ' three - screen general-purpose cleaner. This model is equipped with an overhead blower, an attachment particularly useful for cleaning grain direct from the combine harvester; straws and a large amount of the green matter are removed prior to the grain passing over the vibrating screens, thus ensuring that the capacity of the machine is fully maintained. The machine has a capacity of 40 to 60 bushels per hour and can be fitted with the overhead blower or a standard feed hopper. The machine will clean and accurately grade for seed or market all classes of grain and seed. Six separations are effected with the aid of carefully designed screens and a variable air blower. The whole cleaning operation is easily controlled and is always visible to the operator. Apart from the higher prices obtained from grain or seed cleaned by this equipment, tail corn is separated during the cleaning operation and provides the farmer with a valuable livestock feed.

The **Dorman Sprayer Co. Ltd.** exhibited several new machines, including the ' Osprey ' constant pressure pneumatic knapsack sprayer. This is an entirely new type 3-gal. capacity sprayer, with a copper tank fitted with pressure-reducing valve to ensure constant pressure and economy of application. The 150-gal. super high/low-volume crop sprayer follows the same lines as the well-established 150-gal. sprayer, which still continues in production. The new machine is fitted with a large capacity pump and wider spray boom, giving 30 ft. cover. In all other respects it is standard. The 150-gal. Lanz ' Alldog ' mounted sprayer is arranged for quick mounting on the Lanz ' Alldog ' tool carrier and is fitted with the standard 150-gal. tank with mechanical agitation, the drive being transmitted from the front p.t.o. The spray boom is rear-mounted, giving a cover of 30 ft. with vertically-sprung side members. The drive to the pump is taken from the rear p.t.o. The company also showed its new 1955 model 40-gal. low-volume tractor-mounted sprayer and its new 60-gal. low-volume sprayer.

Among the machines exhibited by **Penney and Porter Ltd.** were the Mark I ' Lincoln ' grain driers. Although originally introduced to the Smithfield Show in 1952 in all-electric form, it was not until 1953 and the early part of 1954 that these driers in oil-fired and electric form went into production ; results during the difficult harvest have led to keen interest in these units. They incorporate the continuous flow method of drying; passing the grain down the sides of a round tower in between two sections of perforated metal, blowing hot air, the temperature of which is subject to control within fine limits, for the first two-thirds of the distance, after which cold air is introduced to return the grain to atmospheric temperature before bagging-off or putting into silos.

A new universal power shaft adaptor clutch was shown by **J. A. Fishleigh and Son Ltd.** to fit on the power-drive shaft driven from any tractor or other engine p.t.o. to meet the requirements of a safe and uninterrupted working of a baler, combine or any machine run by a p.t.o.

A new development in the range of Fordson Major tractors was shown for

the first time at Smithfield by the **Ford Motor Co. Ltd.** This consisted of a tricycle conversion made by Roadless Traction Ltd. which is fitted at the time of the manufacture of the tractor at Dagenham and will be available in export territories only. The twin front wheels are fitted with 5.50 x 16 pneumatic tyres. The maximum angle of lock is 120°, which, in conjunction with the steering brakes, means that tractor manoeuvrability is improved. The under belly clearance is 16½ in. and the tractor wheelbase is increased from 80 in. to 88.7 in. This will simplify the attachment of such mid-mounted implements as hoes, drills and cultivators.

The ' Silorator ' forage harvester was shown by **Silorators Ltd.** It remains virtually unchanged for 1955, with the exception of strengthening to the reflector, inlet chute and guard rail. Three new attachments were shown as follows: (a) inlet reducer ring, which is stated to improve the efficiency of the machine on short lush crops; (b) Webb trailer-hitch, which is said to enable two - wheeled rear - mounted trailers to be towed behind the harvester without upsetting the balance of the machine; and (c) stabiliser unit to prevent the off-side cutter head from digging into the ground on uneven surfaces.

The **Sigmund Pumps** exhibit comprised a comprehensive display of modern pumping units and irrigation equipment. Among equipment shown was the Sigmund sector gear conversion unit, specially designed for fitting to existing Sigmund R2 and R3 rainers. This unit enables these rainers to rotate in either a full circle or in a sector of a circle only by setting the stopper-pin by means of a thumbscrew.

A new gardening and horticultural implement was shown by **Allen and Simmonds (Auto Culto) Ltd.** The ' Autogardener ' has been designed for the man with a ¼-acre garden or more, or for the small professional grower. It is stated to plough a single furrow in any ground, to hoe with either fixed or rotary hoes, to cut grass or rough undergrowth with a 2-ft. by 9-in. wide cutter bar, to operate a hedge cutter, hedge trimmer and verge trimmer, and also to operate an air pump for spraying paint, creosote, insecticides and for spraying fruit trees.

Agricultural News from Eire

From our Dublin correspondent

IN the report issued by the Department of Agriculture on conditions during October it was stated that the wet weather made the harvesting of corn more difficult and the unusual warmth caused the ripe grain to sprout, rendering it useless.

Harvesting of wheat, although slow, was completed in most of the Munster counties and in parts of the West. In the Midlands and North, however, a small proportion remained to be cut at the end of the month. Sprouting occurred in many crops during the first three weeks, some varieties suffering worse than others; Atle was fairly free from sprouting in most areas. Grain from combined-harvested crops was of poor quality, the moisture content varying from 25% to 35% and bushel weight from 47 lb. to 57 lb. Because of the late harvest and the advantage taken of the occasional spells of harvesting weather, drying facilities at some mills were overtaxed.

Grain from stationary threshing mills was of fair quality, the moisture content ranging from 20% to 28% and the bushel weight from 53 lb. to 60 lb. An accurate estimate of the average yield per acre could not be made as much of the crop remained to be threshed at the end of the month.

Owing to the bad weather conditions, a small proportion of wheat harvested during the month was not up to milling standard. Prices received by farmers for millable wheat ranged from 51s. to 82s. 6d. per barrel.

The harvesting of barley was completed during the month.

In the northern counties the bulk of the flax crop was stored in fair condition.

The greater bulk of hay was saved in fair condition, but the supply is hardly up to that of last year due to flooding. The bulk of potatoes remain to be dug. Difficult work and slow progress have hampered the sugar beet harvest.

The higher than average warmth favoured good pasture growth.

Non-millable wheat

Mr. Dillon, the Minister for Agriculture, recently met representatives of the flour millers in Dublin and asked that a special effort be made to deal with non-millable wheat by taking it from the farmers, drying it and storing it for conversion into animal feed.

A large quantity of wheat suitable for milling, it is understood, has not yet reached the mills, although much of the grain requiring urgent attention has been dealt with. Reports indicate that the non-millable proportion is relatively small—about 5%. The millers are prepared to reserve part of their drying equipment for the non-millable grain. A price of from 47s. 6d. to 50s. per barrel will, it is stated, be paid for the grain, which is reasonably good, in the circumstances.

Grain-drying facilities

' Having regard to the difference in the size of the two countries, both of which have suffered this year from such bad weather,' said Mr. Douglas Richman, a visiting English expert (machinery technical officer of Plant Protection Ltd.), ' I think Ireland proportionately has more grain-drying facilities than Britain, and what I have seen is good modern equipment, too.' He recently visited the Irish provinces to calibrate seed-dressing machines in view of the introduction of a concentrated dual-purpose seed dressing. The new dressing is applied at the rate of 1 oz. only per bushel instead of 2 oz. as before.

Beet eelworm

Experts from the Thurles sugar beet factory, which handles all the beet grown in the area, addressed a meeting of beet growers following the discovery of beet eelworm in the Kilmore Quay, Co. Wexford, area.

Mr. William Hughes, chief agricultural officer of the factory, said that if beet growing was continued under the present system a time might come when all the sugar factories would have to close. In Ireland, there were only four factories, and they could not afford to have them closed.

Mr. Hughes said that the first eelworm cysts were discovered at Kilmore Quay in 1950 and were identified by the College of Science, Glasnevin, Dublin.

The Second British Weed Control Conference

THE successful holding of the First British Weed Control Conference at Margate in November 1953 led to the setting up of the British Weed Control Council, the functions of which include the organisation of Weed Control Conferences at such intervals as are considered desirable.

In pursuance of this, the second conference was held on November 2 to 4, 1954, at the Majestic Hotel, Harrogate. The president of the council and of the conference was Sir James Scott Watson, C.B.E., LL.D., Chief Scientific and Agricultural Adviser to the British Ministry of Agriculture and Fisheries, while the chairman of the council was Dr. E. T. Holmes. The conference was attended by upwards of 400 delegates drawn from all parts of the United Kingdom as well as from the U.S.A., from many of the countries of Europe, from the Dominions and Colonial Dependencies of the British Commonwealth and from a number of other countries in various parts of the world.

The conference programme

The programme of the conference was a large and ambitious one, covering almost every aspect of weed control; over 60 individual papers had been entered for presentation, and to permit of all these being read and time allowed for discussion necessitated a strict rationing of the period allotted to individual speakers and a rigid adherence to the time table; it also entailed meetings which considerably exceeded the average in duration. Nevertheless, despite these difficulties, the programme was satisfactorily completed in full, a fact which reflected credit on those responsible for the organisation of the conference.

At the opening session on November 2, after a brief address of welcome from the president, Sir James Scott Watson, the morning was devoted to a series of papers which reviewed the history of modern weed control in perspective. The subsequent sessions on the same day included the consideration of a series of research reports covering problems of weed control in horticulture, grassland, herbage seed crops, leguminous crops, the control of grass and roadside herbage and new chemicals for weed control. The morning of November 3 was given up to application problems, including the mechanical, economic and legal aspects thereof; on the afternoon of the same day the subjects dealt with included weed seeds and weed dispersal and the mode of action of herbicides. On Thursday, November 4, the subjects treated at the morning session included experimental techniques in the application of herbicides, weed control in cereal crops and row crops, and the use of seed drill surveys in studying weed problems; in the afternoon the subject considered was the control of woody weeds under colonial conditions.

When it is said that under the majority of each of the above heads from four to six papers appeared and that the discussions under each, although of necessity restricted, brought forth on a number of occasions some sharply opposed points of view, the wide range of the conference will be appreciated.

Limitations of space preclude any detailed report of the proceedings; the most that can be done is to record a few of the salient points.

Points from contributions

In his opening address, Sir James Scott Watson, after welcoming delegates, commented on the remarkable growth of chemical weed control in the past few years and reminded his hearers that weed control was only one aspect of good husbandry. He was followed by Dr. W. G. Templeman, who, it may be recalled, was the first to call attention to the herbicidal properties of the chloro phenoxy acetic acid derivatives.

Dr. Templeman in his paper reviewed the present position of herbicides in British agriculture, pointing out that a settled pattern of use for MCP, 2-4D and the dinitro compounds for weed control had now emerged. In 1953 in Great Britain, between 1½ and 2 million acres of crops were treated, while the total world

Sir James Scott Watson

acreage of crops treated might well be about 100 million acres. There are still many weeds against which no effective chemical remedy is known, *e.g.* the mayweeds (*Anthemia* sp. and *Matricaria* sp.), knotgrass (*Polygonum*), wild oats and black grass. An outstanding major problem is the economic one of the rate of application which gives the farmer the best return. It is

Dr. E. Holmes

only since the discovery of the hormone weed killers that chemical methods of controlling weeds on grassland have been possible, but even so only meagre information is as yet available about the quantitative benefit derivable from weed control. In regard to possible future developments, he called attention *inter alia* to the action of the newly discovered antibiotic trichothecin, and the possibility of using this as a seed dressing to protect crops against the action of non-selective weed killers broadcast over the land. It is a far cry to the realisation of this suggestion, but the way seems to be opening for it.

Following Dr. Templeman, Prof. H. G. Sanders, of Reading University, read a paper discussing the relationship between cultivation and weed control. He reminded his hearers that, while progress with chemical herbicides of recent years had been rapid and spectacular, they are unlikely ever to supply the complete answer, and we should not forget the tradition of clean farming built up by earlier generations. Rotations, cultivations and fallows still have their part to play. Cultivation is a powerful aid in weed control, but it has other objects as well, and weed control is not the only object in farming.

Chemical weed control in the U.S.A.

Following this paper came one by Dr. Warren C. Shaw, of the United States Department of Agriculture, in which he reviewed the situation in regard to chemical weed control in the United States of America. He estimated that the yearly losses of crop in the U.S.A. due to weeds amounted to $4,000 million annually; this was equal to the combined losses from insect pests and plant disease. The aspects touched upon included the evaluation of new herbicides, among which are included the substituted ureas, which comprise some of the most promising new pre-emergence herbicides and soil sterilants. Other promising new herbicides are N-1 naphthyl phthalamic acid, 2-2 dichlorpropionic acid, and 3 amino 1, 2, 4, triazole.

In the U.S.A. today, there are chemicals which can be applied as pre-planting, pre-emergence, post-emergence and soil sterilant treatments.

Dr. Warren Shaw

The tendency is to greater specificity and to use particular chemicals for the eradication of particular weeds. Progress is being made in the study of the relationship between molecular structure and herbicidal activity. Methylation appears to affect the translocation of certain compounds in the plant, while methyl substitution in the 2 position in the ring of the phenoxyacetic acids decreases their toxicity to certain broad-leaved species of plants. Research has shown that the action of herbicides may be powerfully influenced by the character of the soil. In general, the highest activity of pre-emergence herbicides is obtained on sandy soils low in organic matter. Very great emphasis is laid on chemical control of weeds in the U.S.A. and numerous weed control practices have been evolved in competition with, and as supplements to, cultural weed control. In regard to horticultural crops, such as vegetables and bush fruit, results have been even more outstanding than with field crops.

Sir Edward Salisbury

Spraying machinery and weed persistence in Great Britain

Other notable contributions which appeared included a paper by Mr. Claude Culpin, of the Ministry of Agriculture's Advisory Service, well known as the author of what has come to be regarded as the standard British textbook on farm machinery, in which he passed in review the main features of recent developments in spraying machinery in Great Britain and discussed modern trends in that regard; also a paper by Sir Edward Salisbury, Director of the Royal Botanic Gardens at Kew, in which he discussed from the point of view of the ecological botanist the problems of weed dispersal and weed persistence in the face of efforts to eradicate them, taking his examples from British farming practice.

New developments in chemical weed control

A noteworthy feature of the conference was a paper by Prof. R. L. Wain, of Wye College, in which he explained and discussed the significance of new experimental work in his department which appeared to open up a vista of new possibilities in chemical weed control. This paper constituted an extension of that read by him to the jubilee conference of the Association of Applied Biology previously referred to in the November issue of WORLD CROPS. This work indicated that certain plants possess the power to break down by enzyme oxidation in their tissues certain homologues in the phenoxy carboxylic acid series to form hormone weed killers. In some cases, the effect is marked; in others it does not occur. It appears to depend on the chemical compound employed and to be related to the number of CH_2 groups in the side chain; compounds containing an odd number of CH_2 groups yielding the active acetic acid derivative, while those containing an even number are degraded to the inactive phenolic compounds. Prof. Wain con-

sidered that this development might open up a new approach to hormone weed control.

The destruction of woody vegetation in the tropics

Prof. G. E. Blackman's account of the attempted eradication of woody vegetation in Tanganyika by spraying with hormone weed killers, in connection with the campaign for the control of tsetse fly, also calls for mention. The destruction of vegetation eliminates places where the fly can breed and harbour and is thus an essential step in reclamation of the tsetse-infested areas. Prof. Blackman exhibited a series of slides showing that this form of treatment had succeeded in eradicating dense bush under conditions in Tanganyika.

General

On the evening of Tuesday, November 3, the delegates to the conference were entertained by the Mayor and Mayoress of Harrogate at a civic reception and dance, while on Wednesday, November 4, the conference banquet was held in the banqueting hall of the Majestic Hotel.

It is impossible in a short summary to do more than indicate some of the highlights of this conference. On all hands, it was conceded to have been very successful, although if Prof. Wain's paper is excepted, it cannot be said to have been productive of any striking new advances, while the long sessions necessitated by the attempt to include the whole of the papers into three days' proceedings made it somewhat strenuous.

Photos: P. 31 (below) and p. 32, 'Farmer and Stockbreeder.'

U.S. Barley Imports

President Eisenhower has issued an order limiting imports of barley into the United States to 27,500,000 bushels for the year which began on October 1. At the same time, the President rejected a recommendation by the Tariff Commission that the United States add tariff fee of 8 cents a bushel on imports above 22,500,000 bushels.

The commission had investigated barley imports after receiving complaints that they were threatening markets for domestic barley.

Australian Olives

E. G. WILSON

The growth of olives has lately been extended in Australia and this article gives some account of the position.

AT the foot of Mount Zero, the northern terminus of the Grampian Mountains of Victoria, Australia, lies the largest olive plantation in the Southern Hemisphere. Six years ago this was part of many square miles of bush, a land of native trees and shrubs that had for thousands of years been undisturbed by man. The owner of this plantation, after considerable experimentation, had succeeded in finding a strain of olive trees suitable for Australian conditions. Then came the point of finding a location.

Previous orchardists had imagined that olive trees would thrive anywhere regardless of soil and climatic conditions. This is not the case and earlier efforts to grow the crop had resulted in complete failure. Horticultural experts found the present location, which is ideal for olive trees.

Then followed the task of reclaiming the land. Bulldozers were used to clear the heavily wooded slopes. The area was ploughed, subsoiled, levelled and graded, fences were erected and firebreaks made, after which the land was ready for planting.

Soil and drainage

Olive trees will not tolerate poor drainage, nor the presence of standing water for any length of time, and they can be seriously injured by a relatively small amount of sodium carbonate or black alkali in the soil. They may succeed to a limited extent on shallow, poor soils, but they prefer deep soils, rich in organic matter. A deficiency of boron causes twig, leaf and fruit injury.

When the land on this plantation was first ploughed it was allowed to lie fallow for some months to aerate the previously virgin soil. Later, the land was subsoiled to a depth of 2 ft., and this improved the drainage.

Planting out

Olive trees are sun-hungry and it is essential that they should be grown on sites which receive the maximum solar radiation throughout the day. On this account, they should not be planted close, as when they reach maturity the trees will become spindly and grow to a height in their search for sunlight; a wide spacing between rows and trees enables them to bush outwards. On this plantation, the rows and trees are approximately 40 ft. apart.

Olive trees are best grown when budded on root stocks; although cuttings may succeed to some extent in shallow soils, it has been proved that an olive tree grown on a root stock does better than a tree of the same variety grown from a cutting.

Climate

The average annual rainfall on this plantation is 25 in., and this is an ample quantity for olive trees, particularly if the rainfall is distributed evenly throughout the year. The trees are not normally affected by frost, and it is only in the flowering season that they are susceptible to this menace; in Australia, the trees do not flower until late in November, by which time all danger from frost is past.

The situation of this particular plantation is ideal. It lies north of the mountains and is therefore exposed to the sun throughout the day. The soil is rich, deep and porous, the rainfall is adequate, and the drainage perfect, even during the wettest weather.

The type of olive trees grown had to be a species peculiarly suited to Australian conditions. The type selected was of the Verdale strain. These are utilitarian olives, which may be used equally for pickling or for oil manufacture.

Picking

Because of labour shortage, 'picking' has always been a problem to Australian growers. Picking methods used are generally primitive. Pickling olives are harvested by hand; that is, they are laboriously plucked one by

Bush prior to bulldozing

one and dropped into bags or buckets. This is a slow, tedious system and therefore it is economically unsound. Although the methods applied to oil olives are perhaps less tedious, they are even more crude. In this case, they are beaten from the trees with sticks, a practice which economises on labour but injures the trees.

Some improvement was necessary, and this has been achieved by developed types of tree which will offer the least possible resistance to pickers. 'Verdalion' trees bear exceptionally large olives, which grow in thick clusters instead of singly, as is the case with other varieties. This enables them to be picked rapidly and the task is made far more congenial. To illustrate the difference, in the case of an ordinary tree a man will pick in one day 4 cwt. of olives, whereas the same man, working on Verdalions, would be able to pick 12 cwt. of olives per day.

Olives are ready for picking in Australia in May, June and July, a time of the year when picking of all other stone fruit has ceased; the labour released by these industries naturally gravitates to the olive plantations, which offer further casual employment. In years to come it is possible that olives will be harvested mechanically. Machines for this purpose are being developed and may shortly be on the market.

Five-year-old olive tree

Market outlook for Australian olives

Australia does not fear competition from the olive-growing countries of the Mediterranean. Before the war, it was necessary to import large quantities of olives and olive oil from countries such as Spain, Italy, Greece, Tunisia, France, Syria, Turkey and Portugal, but the Civil War in Spain and World War II seriously damaged the trade of major olive-producing countries in the Mediterranean. A large percentage of the plantations were wholly or partially destroyed, and it will be many years before the damage can be rectified. In countries such as France and Greece the majority of holdings were extremely small, and the owners did not have large reserves of capital. They could carry on so long as their ancient trees were undisturbed, but now, if they wish to resume cultivation, they must plant new trees and wait several years before they can pick the first marketable crops.

It is estimated that it will be at least 20 years before the olive industry in these countries can be fully re-established, and it is likely that, even then, the entire production will be readily absorbed by markets nearer home. Even after Australia has supplied her steadily growing home markets there will be plenty of openings for exports.

America has large olive plantations, but the crops do not satisfy all the demands. Even if they extend the plantations, they will still have to import millions of gallons of olive oil yearly. And across the water lies Australia, which should in the future be able to fill this gap.

Olive products

An increasing number of by-products are obtained from the olive tree. The best known, of course, is olive oil. In its raw state, it has many domestic and commercial uses. It is used extensively in the manufacture of soaps, cosmetics, ointments, shaving creams and toothpastes. When refined, it yields edible and medicinal oils. Even the residue (pulped flesh and

Olive plantation at the foot of Mount Zero

seeds) has a commercial value. It makes an excellent poultry feed; it is also used as a fertiliser and can be converted into a concentrated fuel. Recently, an attempt has been made to convert it into a plastic material. The work is still in the ' secret experiment ' stage.

The outlook for olive growing in Australia

The prospects for the industry are considered to be very favourable. In the foothill region of the Grampian Mountains in Victoria lie many thousands of acres of land, at present in bush, which are entirely suitable for olive growing.

Recently, the Victoria government issued a development report which in relation to olive growing in this particular area states:

' An appreciable area of olives is already under cultivation and cropping has commenced, although the trees have not as yet fully matured. It has been calculated that 5 acres of olives, which can easily be handled by one man, would at current prices yield between £4,000 and £5,000 Australian currency per annum. The ever-increasing number of migrants arriving in Australia will, it is claimed, increase the demand for olives and an opportunity is afforded in the Grampians area to build what could become a very important industry.'

Rice Conference Recommendations

' Reasonable reduction ' in prices and the relaxation of restrictions on imports and exports were among recommendations which the United Nations Food and Agriculture Organisation decided to make to member governments at the end of an eight-day rice conference in Rangoon. Importing and exporting countries should also carry heavier stocks as a means of helping to stabilise international prices.

Another recommendation urged member governments that consideration should be given to abandoning or relaxing any remaining rationing or restrictions on the consumption of rice.

The conference further decided to request a general direction of FAO that a ' comprehensive study be made as soon as possible of the various measures which might be adopted for the stabilisation of international trade in rice, including the financial implication of such measures.' This study would be circulated to member governments with a view to convening a meeting before which a group of experts should meet in the Far East to compare the quality standards of different countries and examine the possibility of arriving at common standards.

R.A.S.E. Research Medal

The Royal Agricultural Society of England has decided to offer annually a medal, together with an award of 100 guineas for research work of outstanding merit carried out in the United Kingdom which has proved, or is likely to prove, of benefit to agriculture.

Recommendations for this award must be submitted to the Secretary, Royal Agricultural Society of England, 16 Bedford Square, London, W.C.1, in January of each year by the heads of university departments, research stations and institutes and other research establishments. No direct application by candidates will be considered. Recommendations must be accompanied by a brief statement of the candidate's attainments and a list of his publications.

C.A.E.C. Meeting

The Minister of Agriculture and Fisheries, the Rt. Hon. D. Heathcoat Amory, accompanied by the Joint Parliamentary Secretaries to the Ministry, the Earl St. Aldwyn and Mr. G. R. H. Nugent, M.P., presided recently at a conference in London of Chairmen of County Agricultural Executive Committees.

The Minister paid a tribute to the voluntary service rendered by members of the County Agricultural Executive Committees and their sub-committees and district committees and said he was sure he could count on them to continue to give him their help and advice in the same ungrudging way as they had always given it to his predecessors.

In a general discussion about the work of county committees and district committees it was agreed that the technical development work of these committees had become one of their most important functions. The need was stressed for district committee members to maintain the intimate knowledge of their districts so that they would continue to know which farmers needed help and advice.

The conference discussed how landlords and tenants might be encouraged to use their own initiative and enterprise still more to raise standards of farming and estate management.

A Problem Area in Norfolk

Fig. 1. Leylands Farm with implement shed at rear, part-covered yard, milking house on left

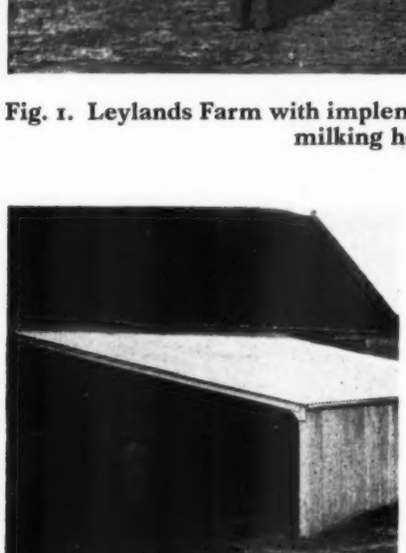


Fig. 2. A 'drive through' implement shed

RECENTLY, the Ministry of Agriculture's Land Service, who act as agents for the Agricultural Land Commission, invited members of the Land Agents' Society and the Country Landowners' Association to see the problems on part of their 11,000-acre Norfolk estate.

The first day was spent in 'Breckland,' that light land area of Norfolk where, until the recent advent of myxomatosis, rabbit warrens abounded and rabbit damage was one of the farmer's major scourges. All the land seen had been transferred to the Land Commission by the Forestry Commission in 1948. It was purchased in the 1930s for tree planting, but with the increased importance of food production land which after the 1939-45 war was considered too good for trees was given a permanent future in farming. Unfortunately, however, the farmsteads on this land had been neglected for some 20 years and to rehabilitate them was a major task. So far in Norfolk about 4,500 acres have had their buildings renovated by the Land Commission at a cost of some £63,000 and work is in hand on another 1,000 acres. The farms shown to the visitors represented a fair cross-section of the problems which had to be faced.

The first was Leylands Farm, Hockwold. When it was taken over this was 85 acres of land let at 6s. 9d. per acre to a good farmer who lived in the village a mile away. His only buildings were some tumble-down corrugated iron and timber sheds on the Low meadows almost half a mile from the road. The difficulty here was to equip such a small acreage economically.

Fig. 3. Old ox standings converted to boxes

Fig. 4. Two of the yards with cowshed left

Fortunately, there was a 440-acre farm adjoining and it was hoped in the future to add more land from that to Leylands Farm.

First, an implement shed or general-purpose building was put up, using a prefabricated dutch barn type structure, with the plan for a comprehensive set of buildings in mind. Next a small house was built. These together cost £2,600. Last year, it was possible to add 100 acres of land to the holding and the set of buildings was completed at a further cost of £2,500 by converting the implement shed to a barn and adding two wings to form a part-covered yard. On one side were three boxes and a milking house for six with dairy; on the other two boxes and an implement shed (Fig. 1). The financial side of all this shows about 6½% gross return to the landlord. The tenant is happy to pay six times as much per acre rent in return for buildings which enable him to make full use of his crops.

At the next farm some work had been done to the farm buildings by adding cover to the yard and a ' drive through ' implement shed (Fig. 2). The most interesting point about these buildings was the use of T-section prestressed steel rafters and purlins rather than a conventional truss. This roof structure cost about the same as the normal truss and effected a saving in head room, which—particularly in the implement shelter—was most valuable.

The final two visits on the first day were to farms tenanted by Mrs. Bell at Hall Farm, Bridgham, and her son, Mr. Howard Bell, at Stonehouse Farm. The point of special interest at Stonehouse was a comprehensive ' all-under-one - roof ' building erected from secondhand materials. This was formerly a Ministry of Works hut made very strongly out of Krupps steel. The resultant building was most satisfactory, but the cost of taking down, transporting and re-erecting it was as much as a new one.

At Mrs. Bell's, a big repair job had been undertaken and as her main enterprise is milk production the buildings had to be brought up to modern dairying standards. One particularly interesting feature on this farm was the old ox standings. This building had deteriorated to such an extent that it had to be largely rebuilt and was converted to boxes (Fig. 3).

Fig. 5. Bethel farmhouse before and Fig. 6 (*below*) after reconstruction

The milk problem was solved reasonably cheaply by making a good milking house for 17 cows. Part-covered yards on each side of it were then improved and divided into two. This created four yards each capable of holding 17 head of stock—a potential milking capacity for the farm of 68 cows (Fig. 4).

On the second day of the tour, heavy land farms in East Norfolk were visited. These came to the Land Commission from the Ministry of Health, who took over the Bethel Hospital Estate when hospitals were nationalised. Two milk farms were seen. At one the tenant preferred the ' parlour system ' and this had been installed. At the other the tenant, who had an excellent herd of cows, wanted a cowshed for 60. But the landlords were neither prepared to spend at least £4,000 on this item, nor commit the farm permanently to milk production. As a compromise a new milking house for 15 cows, dairy and food store were erected in the centre of four yards.

Probably the job which aroused most interest was a house conversion at Bethel Farm, Kirstead. The old house can be seen in Fig. 5. The oldest part of the house was only held together by balks of timber outside and a massive old chimney 12 ft. square at the base inside. It looked a hopeless proposition to start with, but by careful demolition a really good four-bedroom house with bathroom was achieved at a cost of £1,500, the space taken up by the old chimney nearly making an extra room (Fig. 6).

South African Agricultural Developments

WE have recently received from our correspondent in Cape Town the following news of agricultural developments in South Africa.

Citrus exports

Citrus exports from Port Elizabeth reached a record figure in the second week of October. By then, 1,540,000 cases of citrus had been shipped this winter, compared with the previous record of 1,513,000. Citrus growers claim to have achieved the unique feat of selling an export crop of record size at a record price. The present season ended in October, when the industry shipped from all South African ports more than 6 million cases, 750,000 more than last year's record season. Valencias have been fetching more than 50s. a case, a rise of 10s. and more on last year. Citrus Board officials said that this high price was largely due to the lack of American oranges on the British and European markets because the United States subsidy of 7s. 6d. a case had been withdrawn temporarily.

Canning factory negotiations

The Langeberg Ko-operasie, Beperk, Ashton, Cape, whose shareholders are fruit and vegetable farmers, is reported to be negotiating a deal to merge into its organisation other Cape fruit and vegetable canning factories. This is expected to involve more than £2 million in capital. The negotiations between the Langeberg organisation and other companies would involve the purchase of seven or eight canning factories.

In a circular to its members, L.K.B. says that with so many factories under its control, in strategic areas, it will be able to offer membership of the company to nearly all farmers producing fruit and vegetables for canning. The circular says that during the past few years the planting of fruit trees and the laying out of pineapple plantations has increased rapidly, and the present capacity of the canning factories is expected soon to be inadequate to handle the increased volume of produce. ' Farmers are concerned over the sale of their fruit and vegetables for canning purposes and it is, therefore, essential that stability for the future is ensured.' A direct calculable saving on administration and selling expenses of more than £250,000 a year will be effected if the L.K.B. buys the factories. ' Considerable additional saving will accrue due to the rationalisation of the canneries concerned.' The L.K.B. says it will increase the capacity of its factories where necessary to cope with the increased output of produce by members. With the merger it would not be necessary for canned-fruit manufacturers to erect new factories, nor would it be necessary to establish new canning companies. ' The production of more canned fruit will ensure a stable price for farmers' products and will also ensure stability in the canning industry.' Members of the L.K.B. have authorised the co-operative company to go ahead with its expansion plans.

Hybrid maize

The first large-scale experiment in Natal with hybrid maize—growing it on 75 farms under normal farming conditions—is now under way. If it is successful, it may mean that production can go ahead on a commercial scale. Dr. T. Bogyo, hybrid maize research expert in the Faculty of Agriculture in Maritzburg, said that the hybrid being used in this large-scale experiment was one of the best produced. The farms on which the maize seed would be planted were spread all over Natal. There were also three in Swaziland. The idea was to plant one acre of hybrid maize next to one acre of the ordinary type maize. The scientist's job was to check to see in which area the maize hybrid was most suitable. If the hybrid was satisfactory, it was hoped to produce a few thousand bags for commercial distribution. But hybrid maize would not be issued unless it was found that it does at least 20% better than existing maize varieties in use. There were eight co-operative experiments in which 49 different hybrids were being used.

Maize exports

The Maize Industry Control Board reports that no fewer than 6,500,000 bags of maize have now been sold for export without an overall loss. If these 6,500,000 bags amount to roughly half the undisclosed surplus that has to be exported, however, the Maize Board and the maize farmers are by no means out of the wood yet, as the Board's story of its sales so far makes clear. It says: ' A profit was made on the export of 2,500,000 bags to overseas markets and Kenya between January and April.

' Thereafter news of huge American and Argentine surpluses caused prices on the London market to fall sharply from £27 10s. a long ton in January and February to £22 in May and June. Shipments were then being sold at a loss.' Luckily, the price rose again in August to £27 10s., but it dropped in September and is now £26 5s., or 46s. 10d. per 200-lb. bag delivered in London. From this price of 46s. 10d. in London, between 6s. and 8s. a bag has to be deducted for shipping and insurance, besides another 8s. to cover storage, handling and railage charges in South Africa. This brings the net price paid to the Maize Board down to something between 30s. 10d. and 32. 10d. a bag. Since the Board paid farmers 31s. (last year 32s.) for these mealies, it is obvious that any sustained drop in price on the millions of bags still to be exported could dig a deep hole in the Maize Stabilisation Fund, which is expected to reach about £3,100,000 this year. Railage, though not specifically mentioned by the Board, has made its task of avoiding losses particularly difficult. The new railway tariff has substantially increased the cost of sending maize to the ports. The railways' inability to shift the crop faster prevents the rapid export of larger quantities of maize when prices temporarily rise. Another problem in selling the balance of the surplus without loss is the fact that storage charges mount as the months go by. South Africa as a whole, however, is benefiting by the biggest export maize cheque in its history to increase the nation's reserves of foreign currency.

Shipments of maize in the first seven months of 1954 were valued at £7,518,034, as compared with £216,473 in the same period of 1953. The entire maize harvest for 1954 has now been gathered.

NEW BOOKS

Advances in Genetics

Vol. 6. Pp. lx + 488. New York. Academic Press Inc. 1954. $9.80.

Like its predecessors, Volume 6 of this review, which is intended primarily for specialists, covers a wide range of subjects, some of direct relevance to agricultural production, others of a more theoretical and general biological value. For those mainly interested in the scientific aspects of crop production, the contribution by D. Lewis, 'Comparative Incompatibility in Angiosperms and Fungi,' will perhaps have most attraction. The author is well known for his research on the genetics of incompatibility at the John Innes Horticultural Institution. Among the higher plants sexual incompatibility in self- and cross-pollinations frequently occurs, its essential feature being the failure of the pollen, although functional, to grow down the style of the flower and achieve fertilisation. Among the fungi various systems of incompatibility are also to be found. The phenomenon is of importance in the breeding of many crops, all compatibility systems being under strict genetic control. As is well known, the problem of incompatibility is a vital one in fruit growing. Dr. Lewis elucidates and, as far as possible, classifies the different systems according to their morphological, genetic and physiological aspects. His account of the experimental evidence, suggesting that the biochemical control of incompatibility in some cases is probably through an antigen-antibody reaction, is particularly stimulating.

Dr. Lewis also reports that the technique of inducing mutations by X-irradiation of the developing pollen has been successfully applied to genes determining incompatibility: mutation of such a gene causes loss of its activity, so that self- or cross-pollinations hitherto incompatible become compatible. This work is likely to have useful results in breeding sweet cherry and other tree fruits; the cultivation of self-fertile varieties would possess a number of practical advantages.

The longest, but by no means the most clearly expounded, paper is contributed by P. Michaelis, who in 'Cytoplasmic Inheritance in *Epilobium* and its Theoretical Significance' surveys his 30 years' work on hybrids of willow-herb species, on which his highly speculative tenet of a single genetic system composed of interacting nuclear genes and cytoplasmic or extranuclear elements is founded. He attaches more importance to the role of the cytoplasm in the control of inheritance than most geneticists; his views find some support among the results of investigations on micro-organisms.

In 'Map Construction in *Neurospora crassa*,' R. W. Barratt and his colleagues give the results of their onerous undertaking of mapping the chromosomes for the genes so far reported for this fungus. In recent years, *Neurospora* has proved to be highly valuable in the general study of biochemical genetics and the nature of the gene.

A. Robertson writes lucidly on a very topical subject, 'Artificial Insemination and Livestock Improvement.' J. Hancock reviews research on monozygotic twins in cattle. Two papers fall within the province of human genetics: 'Genetic Changes in Human Populations, especially those due to Gene Flow and Genetic Drift,' by B. Glass; and 'The Genetics of the Newer Human Blood Factors,' by P. Levine. The remaining survey, by C. L. Remington, is concerned with butterflies. It describes the genetics of *Colias*, a group interesting for their secondary sex-limited colour patterns.

THERESA ASHTON

A Critical Study of World Literature on the Lepidopterous Stalk Borers of Tropical Crops

By W. F. Jepson, O.B.E., Ph.D. Pp. vi + 127, paper covered. London. Commonwealth Institute of Entomology. 1954. 15s.

In a comparatively few pages, the author has compressed a vast amount of valuable information derived from world literature and based on his extensive experience of all aspects of the stalk borer problem.

The book is divided into eight sections which deal mainly with the identification of the adults, the general habitus of the principal genera of Pyralid and Agrotid borers, their host range, their bionomics, population estimation and damage assessment, the relation of stalk borers to cultural practices and their parasites, predators, diseases and control. The author emphasises the chronic and often serious nature of damage by stalk borers and stresses the need for more systematic work on these insects. With regard to this the reviewer feels he must draw attention to the fact that at present speedy publication of results is rarely obtainable and consequently is a contributory cause for discouragement.

The difficulty of carrying out control measures referred to by the author is largely on account of the fact that graminaceous crops are usually grown on a large scale, often by natives whose apathy it is not easy to overcome and whose co-operation and confidence it is even more difficult to gain.

In the section on control, the author enunciates two essential principles, namely: (1) the basing of control measures on ecological study of the insect and its natural enemies and (2) the necessity for the possession by the entomologist of adequate knowledge of the cultivation of the crop and of local methods and customs.

A difficulty in the control of stalk borers arises from the nocturnal habits of the adults and the protection afforded to the developmental stages by the host plant. Several types of cultural methods are discussed. These comprise the direct destruction of the borer by trapping the adults, by collecting the egg masses, the removal of infested shoots and the destruction of stubble. Avoidance of borer attack by altering planting dates, the use of trap crops and delayed planting are also referred to, but, as the author points out, any alteration of planting date must be without prejudice to the crop and must be based on accurate biological data.

Regarding the cultivation of resistant varieties, the author points out that so far few serious efforts have been made by plant breeders to this end, although here an exception must be made of studies on sugar cane varieties.

Under the section 'Biological Control' the work done on control by parasites is considered. This includes the mass breeding of indigenous parasites and the establishment of introduced parasites. Control by the application of chemicals is becoming more

common, but there is an urgent need for simple and robust distributing machines suitable for the less wealthy cultivator in the tropics.

This critical review is a valuable contribution to the subject and should be in the hands of all workers concerned with the study and control of lepidopterous stalk borers.

N. C. E. MILLER

National Forest Policies in Europe

FAO Forestry and Forest Products Study No. 8. Pp. 370. Rome, Italy. Food and Agriculture Organisation of the United Nations. 1953.

This study contains much more than the bare statements of the accepted policies of 20 countries in Europe. Besides the reports sent in by the governments, there are separate reports on afforestation and reforestation as suggested by the European Forestry Commission meeting in Rome in 1951.

In the policy section, the main heads asked for in the reports are: (1) administration, which includes policy, legislation, ownership, organisation and financial resources; (2) improvement in the quality and quantity of wood produced; (3) utilisation of forest products; (4) timber trade; (5) labour questions; (6) education; (7) research and statistics; (8) miscellaneous, covering associations, congresses and the like.

It is impossible in the compass of a review to discuss details of the various reports under the policy section, which gives very good, though naturally condensed, pictures of the state of forestry today in each country and what is being done about it. The weak spot in the reports is under timber trade, since the information given refers to 1950-51 or even earlier and is largely out of date by now in 1954. Under afforestation the questionnaire asked for purpose and scope of afforestation, present situation, methods of work, difficulties encountered, and local problems; and it is clear that too much has been asked for, since each of the headings could give material for a volume as big as the present publication.

Importance is given to ' economic afforestation ' as distinguished from afforestation for other and indirect objects than the increase of the timber supply of a country. The reports give an aperçu—albeit rather a restricted one—of what is going on in the present decade and are well worth reading by anyone who wants to know about the future of timber supplies in Europe.

Although one may think that FAO has attempted too much in the present volume, it is a good summary of the forest situation in Europe at the present day.

W. A. ROBERTSON

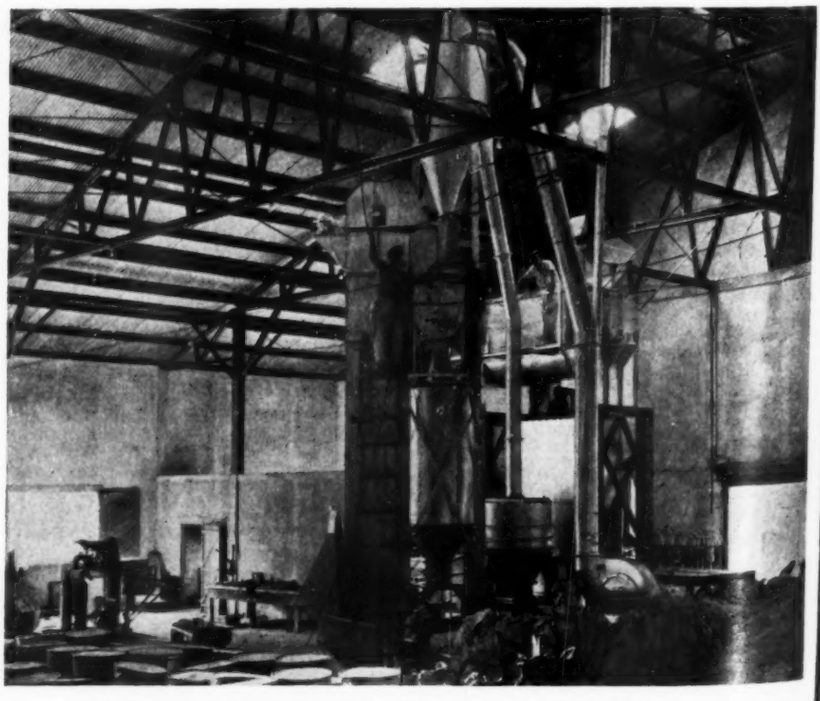
New Insecticide Plant in Central America

The largest insecticide formulating plant in Central America went into production on October 1. It is stated that this plant, which is situated in Managua, Nicaragua, once it achieves quantity production, will satisfy more than half the normal insecticide needs of the Nicaraguan Republic. Engineered by Diamond Alkali Inter-American Corp. for Industrias Quimico-Agricolas, this plant will be able to produce more than 1 million lb. per month of finished insecticides working on an 8-hr. day basis.

With the support of the administration of President Somoza of the Nicaraguan Republic, and with credit from the National Bank of Nicaragua, two Nicaraguan business men, Messrs. Tomas Wheelock and William Pfaeffle, were able to secure the co-operation of Diamond Alkali in building this plant, which will go a long way towards saving dollar exchange and thereby strengthening the economy of the country.

With over two-thirds of the plant's capacity sold for the coming season, the management looks forward to increasing volume bringing benefit to all.

Commenting on Diamond's role in this development, Mr. S. S. Savage, president of Diamond Alkali Inter-American Corp., expressed the view that joint participation in such enterprises by progressive North American corporations is confirmation of their confidence in the developing economies of Latin American countries. Mr. Savage also noted that this project in Nicaragua is one of many in which Diamond is considering the investment of capital, engineering skill and company personnel. This, he said, is the sound approach to future business relations between North and South America. Mr. Savage further stated that the growing trend for U.S. companies to pass on their manufacturing skills to friendly Latin American republics will assure better jobs, better markets and better living for all.



Some of the machinery installed by Diamond Alkali for the new insecticide plant in Nicaragua

REPORTS and PUBLICATIONS

The Annual Report of the Long Ashton Research Station for 1953. The University of Bristol Agricultural and Horticultural Research Station. 1954. Pp. 218. 15s.

The year 1953 was memorable for the Long Ashton Station, for it marked the golden jubilee of the foundation of the institution. The occasion was appropriately celebrated and also marked by the publication of a commemorative volume, *Science and Fruit*, which records the history of the institution over the 50 years and includes a number of articles relating to major studies at the station during this period.

The annual report for 1953 includes a brief account of the jubilee celebrations, but most of the volume is devoted to the director's introduction, in which he outlines research and other activities at the station during the year, and 30 articles contributed by members of the staff, recording progress and results to date of recent investigations.

The Agricultural Research Council Unit of Plant Nutrition, working at the station, report on a number of problems, including molybdenum nutrition, soil acidity, nutrition of fungi and organic constituents of plants.

Amongst articles contributed by the plant pathology section is one describing some applications of the radioactive-tracer technique to plant nutrition studies and another on the fungicidal properties of coal tar distillates, particularly in relation to the treatment of mouldy rot disease of rubber trees.

Since its inception the Long Ashton Station has been closely concerned with fruit utilisation, including cider and perry making. In this connection, the present report includes two articles on perry pears, three on problems in perry making and two on domestic food preservation. As a result of increased interest in perry, a survey has been made of the perry pears of Gloucestershire. The pomological characters of some of the varieties are described and a list of recommended names and their synonyms is given.

One is struck by the prominence given to investigations entailing the use of sprays, not only for the control of pests and diseases, but also for such purposes as hastening fruit ripening and for fruit thinning. Nine such articles are included in the present report, one of which describes the preparation of a combined DDT-BHC emulsion, while amongst others one lists the times, strengths and formulations required in using DDT and BHC for the control of apple and plum aphids and another the application of BHC for apple sawfly control.

The fruit grower may become rather confused by the constantly increasing number of spraying agents, the widening scope for their use, and the advances made in fruit-growing techniques as a result of scientific investigations. The articles contained in this annual report, although written in a technical style, may serve to advise the grower of recent developments in this field of science, but it is only by close and personal association with institutions such as the Long Ashton Station that he can fully avail himself of important advances in knowledge of fruit culture. It is evident that the director welcomes this personal contact, for he records that in 1953, in addition to a large number of overseas visitors, 50 organised parties visited the station.

D. H. GRIST

A Report on the Fertiliser Requirements of the Kenya Highlands. Colonial Office, 1954

For some years past, much attention has been paid to the question of the use of fertilisers and the fertiliser requirements of soils in the Kenya highlands. Evidence has shown that the soils in this region are generally deficient in phosphorus. It has been found, however, that application of Uganda rock phosphate to growing crops has only a small effect, although it may be long-lasting. It was also found that treatment of this rock phosphate by calcining it with soda ash (mined at Lake Magadi in Kenya) produced a citric soluble phosphate of some value. In 1947, a fertiliser research scheme was established in Kenya, under the general direction of the East African Agricultural Research Organisation, to study fertiliser problems of the native areas, but, since this did not cover the European farmer areas, a Highland Fertiliser Scheme was also formed, mainly by the Kenya Government, but with assistance from Imperial Chemical Industries Ltd., who seconded one of their research staff to run this scheme.

Scope and objects of the scheme

The primary object of the work was to determine the best form of fertilisers for the Kenya highlands. The work has been in progress now for three years and the first results are now available.

It was decided that all the common plant food compounds should be tested, including sulphate of ammonia, muriate of potash and ground limestone, while the types of phosphatic fertilisers included Uganda rockphosphate, sodaphosphate and superphosphate. Trials were carried out on soils carrying wheat and maize, while a few sunflower experiments were laid down also. The results were submitted to statistical analysis. The main findings of the report are as follows:

The soils of the Kenya highlands are generally acid, but the application of lime has scarcely given any increase of crop yield; pH5 appears to be about the critical level for wheat, below which applications of lime may prove beneficial. No critical pH levels have been found with other crops and it is very surprising that even lucerne has not benefited from the application of lime in view of the general importance lime has in temperate countries for leguminous crops.

Potash. This fertiliser appears to be relatively unimportant for the crops studied. Muriate of potash has been found to reduce germination to a small extent when placed close to maize seed and it seems possible that placement may be of importance.

Phosphates. It is frequently assumed that all phosphates that are citric-soluble are equally valuable to the plants, but the results indicate that, when compared on a citric-soluble basis, their effectiveness in different conditions may vary considerably.

Uganda rockphosphate (P_2O_5 content of about 2.2%) proved ineffective on most soils. With a low citric-soluble and a high total phosphoric acid content, its residual response may be considered uneconomic.

Seychelles guano was tested in a few experiments. The material used contained 13.4% citric-soluble P_2O_5. The increases of crop produced were neither

statistically significant nor commercially important.

Sodaphosphate and superphosphate were in a different category. They were compared against each other in 133 experiments, which involved 2,800 plots of each. The results showed that, while both forms are effective, the citric-soluble P_2O_5 in superphosphate is more effective than sodaphosphate. Sodaphosphate, when placed below the seed under dry conditions, reduced germination. Superphosphate on the average did not have this effect. Under good rainfall conditions, however, sodaphosphate did not reduce germination. It is suggested that sodaphosphate, being citric-soluble, will be more long-lasting in effect and that in soils where phosphate fixation takes place it would be more effective than a water-soluble phosphate.

The general conclusions are that in most of the areas examined superphosphate is the most effective fertiliser. No special provisions need to be made for making available either agricultural lime or potash. The demand for nitrogen in arable agriculture is at present small, although a sharply rising demand for it for grassland can be foreseen. The need for phosphates is considerable and they are required now in substantial quantities. The materials are believed to be available in East Africa for the manufacture of either superphosphate or sodaphosphate. H.T.

Oilseed Processing in Nigeria—A Statement of Policy. Government printer, Nigeria, 1954

In 1951, Mr. J. C. Gardiner, F.C.A., was commissioned by the Government of Nigeria to conduct a survey into the economics of the mechanical expression of oilseeds in Nigeria, with particular reference to whether there is a *prima facie* case for the Government of Nigeria and/or the Nigerian Marketing Boards to establish a plant for the large-scale expression of oilseeds in Nigeria.

The report has now received attention from various governments. The conclusions of the report were that Nigeria would gain no advantage if it discarded the export of groundnuts and palm kernels in favour of commodities mechanically processed from these crops. Indeed, evidence shows that it is to Nigeria's advantage to continue the export of oilseeds. However, it is considered that advantage may attach to oilseed expression to meet the expanding local market for oils and oilseeds. In regard to groundnuts and palm kernels, the Nigerian Government have accepted these recommendations.

It is considered that there are sufficient reasons to accord favourable consideration to applications for declaring cotton seed processing a pioneer industry, since at present market values it is scarcely economic to export unprocessed cotton seed. Incidentally, it seems curious that in considering this question the point does not seem to have been taken into consideration that the exportation of whole oilseeds involves the export of considerable amounts of fertilising materials, and that from the point of view of maintaining the fertility of Nigerian soils there is a definite argument in favour of local processing with the object of exporting the oil, but retaining the press cakes in the country of origin.

Co-operative Hybrid Maize Tests in European and Mediterranean Countries—1952. FAO Development Paper No. 42, 1954

This bulletin contains an account of the most recent results obtained in the co-operative hybrid maize tests which have been carried out by FAO in various European countries within the past few years.

Hybrid maize is one of the most significant contributions to European agriculture which FAO has so far made. This report contains the results of trials on North American hybrid maize carried out in Europe and the Mediterranean countries since 1948. Figures from 300 tests in 14 countries in 1951 and 1952 show that the best of 45 United States and Canadian maize hybrids provided by FAO out-yielded the best local open-pollinated varieties by about 50%.

Official recommendations to farmers on specific North American hybrids suitable for growth under their conditions are now based on data which enable governments to establish sound seed purchasing and seed production policies. As a result, the usage of hybrid maize is rapidly expanding in Europe, having almost doubled from 1952 to 1953. In the latter year, it contributed nearly half a million tons of extra grain worth 40 million United States dollars.

A meeting of maize specialists was held in Belgrade in February 1954, when information on methods used to popularise hybrid maize in Europe were exchanged. It appeared that if these methods were more generally applied hybrid maize would show even more spectacular advances within the next few years. With this in mind it has been decided to strengthen the assistance provided by FAO.

World Festival of Trees. FAO Forestry Development Paper No. 2

It has long been a tradition in many countries to hold annually a tree or forest festival and the origin of this practice dates back to antiquity. Tree planting festivals help to inculcate a love of trees and an understanding of their importance in the general welfare of the human race; this is obviously desirable, and with the object of popularising knowledge of this subject and encouraging the holding of such festivals the Forestry Division of FAO has produced this bulletin, in which the history of tree festivals is outlined, the main features essential for their organisation and the manner in which they can best be held described and the response from various nations to a suggestion from the director of FAO that the organisation of such festivals is desirable are summarised and set out. It is interesting to note that in many countries such festivals are regularly held, while practically all countries expressed themselves as favourable to the idea of organising them. Let us hope, therefore, that in due course the number of festivals of this description will increase.

WORLD CROPS

IN OUR NEXT ISSUE there will appear the second part of **Fish Culture in Conjunction with Rice Cultivation,** by W. H. Schuster. T. K. Cordes will write on **Spray Irrigation,** while J. Sholto Douglas will discuss **Soilless Cultivation.** There will also appear in this issue a review of the **Cotton Industry of the British Commonwealth,** besides other articles and the usual features.

Home Grown Threshed Peas Joint Committee Report for 1952-53

This booklet contains three sections, namely, the committee's ninth annual report, a report on the operation of the 1953 Dried Pea Seed Approval Scheme and a third progress report on field experiments. The report contains a record of a large amount of useful work and gives a complete review of the progress made in the cultivation of peas in the United Kingdom.

During 1953, the pea crop was largely free from the more important pests and diseases, although a number of crops suffered from the effects of frost. The damage done by the wheat bulb fly in the spring of 1953 fixed attention on methods of control. Peas are among the crops which are dangerous to a following wheat crop unless precautions are taken. Products are now coming on the market to protect the following wheat crop from attack.

The committee has continued to stress the value of fertilisers to the pea crop and very convincing evidence is now available that side-band placement of fertiliser gives better results than broadcasting.

The report contains a full account of many experiments carried out by the committee on various aspects of pea cultivation, including varieties, manuring, weed control and the control of pests and diseases. It will be found of great interest by all concerned with the cultivation of pea and bean crops. The report is illustrated by a number of excellently reproduced photographs and is available from the Home Grown Threshed Peas Joint Committee, 4 Westgate, Peterborough.

Weeds of the Gezira Scheme, by F. W. Andrews. Bulletin No. 13 of the Ministry of Agriculture of the Sudan Government

This bulletin is intended to facilitate the identification of common weeds which occur in the Sudan Gezira.

The weeds are listed alphabetically under their vernacular names. The book is illustrated by a series of line drawings of the weeds described, which, together with a key, facilitates identification.

The bulletin represents an enormous amount of work on the part of the author and will no doubt be found to be of great value to those concerned with cultivation in the Sudan Gezira.

Proceedings of the Second Conference of the Tea Research Institute of East Africa. Pamphlet No. 8 of the East African Tea Research Institute, 1954

This publication contains the report of the second conference organised by the Tea Research Institute of East Africa.

It was held under the chairmanship of Sir Bernard Keen, director of the East African Agriculture and Forestry Organisation. The bulletin contains a series of papers by Dr. Eden, lately director of the institute, Dr. R. Child, deputy director of the institute, Mr. J. R. Todd and Mr. N. A. Goodchild, the subjects of which are: ' Desirable Features of Tea Factory Organisation,' ' The Chemistry of the Tea Leaf in Relation to Manufacture,' 'The Assessment of Fermentation in Tea ' and the ' Causes of Dieback in Tea,' together with a report of the discussion on the various papers.

It is obvious that the Tea Research Institute of East Africa is performing valuable work in relation to the development of the tea industry in that part of the world and that its operations are appreciated.

Dr. Eden, who has directed the institute from its beginnings, has recently retired and during the conference reference was made to this and appreciation expressed of the work that he had carried out for the tea industry since he arrived in East Africa.

The Journal of the West African Institute for Oil Palm Research, No. 2, 1954

The second number of the journal of the West African Institute for Oil Palm Research marks a definite advance on its predecessor. It contains a number of valuable papers, including one by Mr. C. W. S. Hartley on the ' Improvement of Natural Palm Groves,' one by Mr. R. A. Bull giving a preliminary list of ' Oil Palm Diseases in Nigeria,' another by the same author on ' Deficiency Diseases in the Oil Palm ' and a third by Mr. R. A. Bull and J. B. Allen on recent severe attacks on oil palms by two new caterpillar pests.

All of the papers are extremely interesting, most of them are fully illustrated with photographs and some have coloured illustrations. The entire production sets a new standard for colonial agricultural publications and the direction of the station is to be congratulated on the result.

Aldersley Engineers' Director

At the annual general meeting of Aldersley Engineers Ltd., Tettenhall, Wolverhampton, the chairman and managing director, Mr. John B. Carr, announced the appointment of his co-director, Mr. H. J. Digwood, as joint managing director. Mr. H. J. Digwood joined the company shortly after the war and in recent years has acted as director in charge of planning and production. The company's activities now cover the construction of silos, in steel and reinforced concrete, and the full equipment of silos, maltings, distilleries and provender mills.

The British Grassland Society Meeting

The winter meeting of the British Grassland Society was held at the Wellcome Research Institution in London on December 10, 1954. The theme for the meeting was ' Production and all the year round use of grass.' The speakers dealt with one of the big problems confronting British farmers today.

Technical News

The January issue of *Manufacturing Chemist* contains ' The Separation of Volatile Materials by Gas-liquid Chromatography,' by A. T. James; ' Spectrophometric Determination of Thioglycollic Acid,' by G. T. Walker and F. M. Freeman; and ' Organic Synthesis in Perfumery—1,' by F. Schmitt.

Articles appearing in the January issue of *Paint Manufacture* include ' The Study of Thixotrophy,' by R. Quarendon; ' Titanium Pigments,' by L. W. Robson; and ' The Economics of the Paint Industry.'

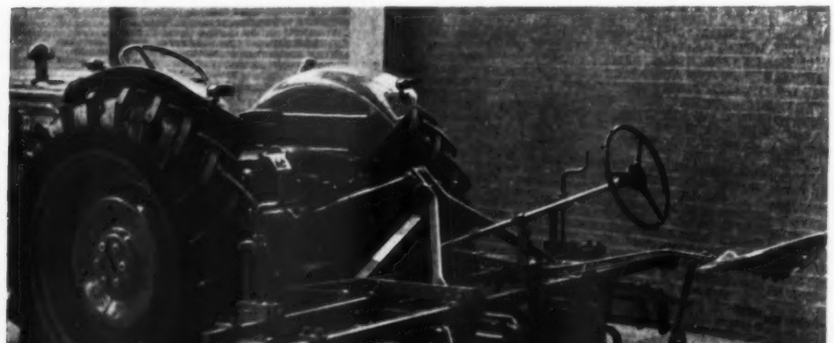
Petroleum for January contains ' Instrumentation and Automatic Control in Oil Refineries—1 (Control Requirements),' by E. H. W. Banner; and ' Corrosion in the Petroleum Industry —3,' by F. H. Garner and A. R. Hale.

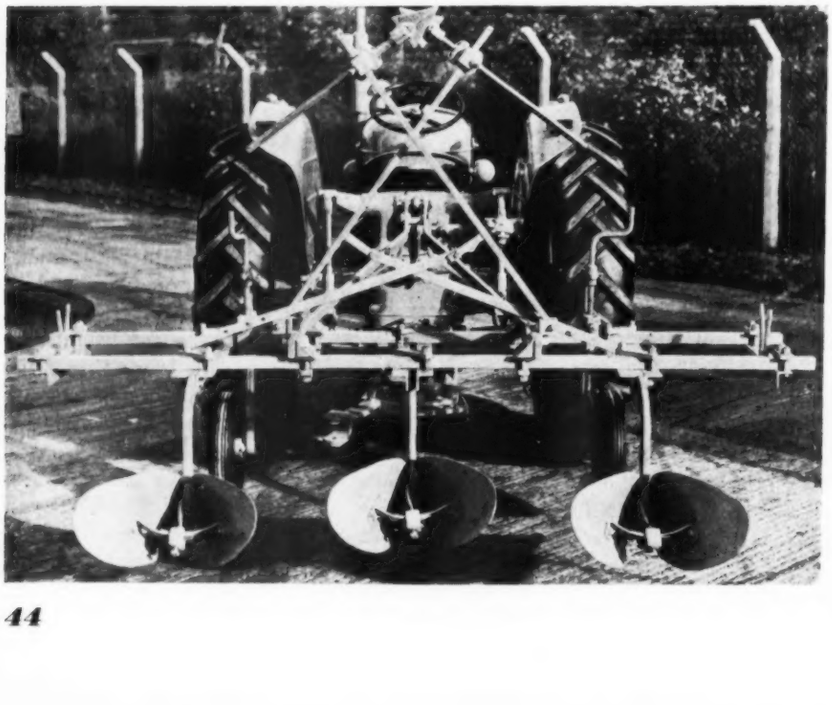
FARM MACHINERY

Ford-Ransomes Agreement

A press conference was held at Ipswich recently to discuss further developments in the working arrangement between the Ford Motor Co. Ltd., of Dagenham, and Ransomes, Sims and Jeffries Ltd. It was in 1945 that these companies first agreed to develop and produce jointly a range of basic implements of the mounted type for the Fordson Major tractor's three-point linkage and for sale under the joint trade mark F-R. Design and manufacturing resources of the two companies were pooled. The joint programme was planned in three stages whereby at the commencement all implements were to be built at the Leamington factory of Ford. Stage two provided for the building of the implements both at Leamington and Ipswich, and the third stage, which commences on January 1, was for the entire production to be taken over by Ransomes at their Ipswich factories.

Mr. Geoffrey Pawlyn, deputy chairman Ransomes, Sims and Jeffries Ltd., speaking at the conference





New F-R implements are (*above*) **a four-row independently sprung tine steerage hoe on C.73 100-in. toolbar and** (*below*) **a three-row ridger on C.73 100-in. toolbar**

Market arrangements

In the home market, the F-R range will continue to be marketed by Fordson dealers and Ransomes agents, actual distribution being carried out by Ransomes. For export, Ransomes will supplement the F-R implements with their comprehensive range of products, which will be sold in future under the new name F-R Nacton. The Ford Co. will continue to control overseas distribution of F-R farm machinery, with the additions to the range of the F-R Nacton farm machinery. It was emphasised, however, that both at home and abroad the new arrangements will not affect supplies to Ransomes's existing dealers.

Nacton factory

A new factory, situated at Nacton, near Ipswich, intended to meet the increased demand for farm machinery is now almost complete. This factory will double the manufacturing area of Ransomes present facilities.

Before the conference a demonstration was held of implements and machines produced by Ransomes.

WORLD CROP REPORTS

WORLD

Flaxseed production. World flaxseed production in 1954 is forecast at 132 million bushels on the basis of preliminary data available to the U.S. Foreign Agricultural Service. This volume of seed would surpass the 1953 estimated outturn, now revised to 121 million bushels, by 9% and would be the largest crop since 1950. However, it would still be less than the pre-war average of 133.5 million bushels. The anticipated expansion from 1953 is accounted for principally by the expectation of a significant increase in Argentina and larger harvests in the United States and Canada. India's production is down slightly.

North America

Production in North America may increase by roughly 10%. Canada's crop, currently forecast at 12,189,000 bushels, is about 23% higher than that for 1953 and nearly 32% greater than the ten-year (1944-53) average outturn of 9.3 million bushels. The anticipated larger crop is attributed almost entirely to increased planted acreage, as expected average yields in most provinces are not greatly different from those of 1953. As on October 1, the official estimate of the United States harvest was 39,989,000 bushels, 9% above last year and 7% above the ten-year average (1943-52). Although the acreage harvested is the second largest on record, the yield per acre is below last year and below average. Extremely high temperatures in late July and continued hot, dry weather in early August were largely responsible for the lower yields. Moreover, wet weather and late September frosts damaged the crop in North Dakota and Montana. Mexico's crop appears to be down about one-fifth.

Europe

Flaxseed production in Europe in 1954 is expected to decline from 1953 by possibly 7%, with the greatest loss indicated for the Eastern area. In Western Europe, the sharp drop expected in Sweden, the United Kingdom and, to a lesser extent, the Netherlands, considerably outweighs the increase foreseen in Belgium and possibly France. It appears that output in the Soviet Union continues to be below the pre-war level.

A slight decline in flaxseed production is likely in Asia as output in India, officially estimated at 14.2 million bushels, is 1% below the 1953 crop. The smaller Indian harvest is attributed mostly to the acreage decrease and adverse weather in three of the major producing states. Pakistan's crop is officially placed at the same level as each of the two previous years. Production in Turkey and Japan has not been reported as yet.

South America

Forecasts at this time of flaxseed production in Southern Hemisphere countries are largely speculative. Production in the Argentine is expected to increase substantially. The condition of the crop in late September reportedly was considerably better than for 1953 at the same time and continued favourable conditions might result in a crop of around 20 million bushels as against 13,684,000 bushels in 1953.

In Uruguay, indications are that plantings will exceed those of 1953 by approximately 10%. The increase is attributed in part to the smaller area sown to wheat and higher flaxseed prices. With this acreage expansion, production could be around 3 million bushels. (Although the official estimate of 1953 flaxseed production remains at 2,795,000 bushels, trade sources are of the opinion that output may have been closer to 3.5 million.) Thus, should these possible increases materialise in Argentina and Uruguay, total output in South America would be nearly 40% greater than in 1953.

Production in Africa is expected to decline around 6%. The tentative forecast of output in French Morocco alone, the major producing country, reflects a 10% drop from 1953.

Flaxseed output in Oceania may possibly double last year's. In Australia, demand for seed for the 1954 crop has been heavier than last season when acreage declined sharply. Provided there is adequate rainfall, a substantial recovery in plantings can be expected. And in New Zealand acreage may be twice the area of 1953.

Foreign Crops and Markets.

ENGLAND AND WALES

Agricultural report. Agricultural conditions in England and Wales on November 1, 1954, have been summarised by the Ministry of Agriculture. The harvesting of cereal crops was practically complete in eastern and south-eastern areas, but elsewhere some crops had not been secured. Quality was generally below average and yields per acre were expected to be below the average of the five years 1949-53. Progress was made with cultivations and sowing in eastern and south-eastern areas. Blight on potatoes affected tubers in some western areas, but generally the quality was better than expected; the yield per acre was expected to be lower than last year, but about the same as the five-year average. Other root crops were also expected to yield less than last year. Attempts to secure further hay was given up and haymaking was virtually finished.

The weather during October was generally mild. Eastern and south-eastern areas had periods of dry weather, but elsewhere there was considerable rain, and floods occurred in some northern areas and parts of Wales.

Corn crops. The harvesting of wheat, barley and oats was practically complete in eastern and south-eastern districts, but elsewhere there were areas, chiefly of spring wheat and oats, which had not been secured and some fields may have to be abandoned. The quality and condition of the grain was reported to be below average, and the moisture content, especially of wheat, was high. The yields per acre were expected to be as follows:—

	Forecast of 1954 yield	*1953 yield*	*Five-year average*
	cwt.	*cwt.*	*cwt.*
Wheat	21.7	24.0	22.3
Barley	20.2	22.6	20.5
Oats	18.4	21.2	19.3

Progress was made with autumn cultivations and sowing in eastern and south-eastern areas, but elsewhere the wet state of the soil and in some cases the protracted corn harvest delayed operations.

Potatoes. The lifting of potatoes was delayed because of the water-

logged state of the ground in some northern districts and parts of Wales. Elsewhere fair progress was made, especially in eastern areas. Reports on quality and condition showed some variation; in several areas, mainly in the western half of the country, blight affected tubers and might in some areas affect the keeping quality, but on the eastern side of the country the quality was generally better than expected, considering the incidence of blight on haulms. The yield of second early and maincrop varieties was expected to be 8.2 tons per acre (1953: 9.3 tons per acre; five-year average: 8.4 tons per acre).

Sugar beet. Fair progress was made with the harvesting of sugar beet. Roots were of good quality although some crops are 'fangy'; tops were heavy. There were reports of virus yellows from some areas. The yield of roots per acre was expected to be about average.

Roots. Turnips and swedes were a satisfactory crop, although somewhat weedy. Some mildew was reported. The combined yield of turnips and swedes was estimated at 15.3 tons per acre (1953: 17.8 tons per acre; five-year average: 14.7 tons per acre).

Mangolds were of good quality; roots were generally smaller than usual but sound. The yield was expected to be 21.0 tons per acre (1953: 25.7 tons per acre; five-year average: 22.8 tons per acre).

Fodder beet was a satisfactory crop; roots were smaller than usual and the yield per acre was expected to be rather lower than last year.

Hay. Reports indicated that attempts to secure further hay had been given up and that haymaking for the season was virtually finished. The latest estimates of yields per acre are given below. It should be noted, however, that these latest forecasts are not strictly comparable with earlier figures which were based on the estimated area to be mown for hay, whereas the present estimated yields per acre are based on the area which has been cut and successfully harvested.

	Forecast of 1954 yield
Hay from:	*cwt.*
Temporary grass ..	28.7
Lucerne	38.9
Permanent grass ..	20.3

Pastures. Leys sown during late summer and autumn had taken well in most areas and made satisfactory progress, although some were weedy. Leys sewn last spring (including 'seeds') were well established, apart from some patchiness where corn was laid. Other leys made good growth during the month and provided plenty of keep, but poaching was reported from several districts. Permanent pastures continued to make growth and keep was plentiful.

EUROPE

Sugar beet prospects. The continued rainy weather reported in most areas of this Continent, together with flooding in certain parts, was beginning to cause some anxiety in the middle of November in view of the possibility that lifting might be hampered and deliveries to the factories seriously interrupted. Continuity of root supply during wet periods can normally be maintained from roadside stocks, but any prolongation of adverse field conditions would eliminate such stocks and halt deliveries. Quite apart from adding to production costs lifting delays due to excessive rain would accelerate the decline of sugar content which would not in any case be unusual in muggy conditions at this time of the year.

While there have so far been no very serious complaints of interruption of slicing—with the possible exception of Germany—reports of high dirt tares have been a feature of the harvest.

There is understandably a general reluctance even at this date to assess present adverse harvesting conditions in terms of possible estimate reductions, but any changes in the figures are more likely to be downward than upward. In Britain, slicing had been proceeding satisfactorily, but in some parts lifting was being hindered by the waterlogged state of the fields. Similar conditions were being experienced in the Irish Republic where potatoes and even grain had still to be got in.

Reports from the U.S.S.R. of a substantial decline in the grain harvest in the Ukraine in consequence of drought have prompted the suggestion that the beet crop in this the most important sugar area of the Soviet Union may also have suffered. Press reports from that quarter have made no mention of unfavourable conditions attending the beet campaign; indeed, it has been stated that by the third week of October only 25% of the crop remained to be lifted, although it was admitted that transport to the factories was somewhat of a bottle-neck and urgent steps were being taken to hasten the flow of beets from the more northerly areas.

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EGYPT

Cotton prospects. A decision by the Council of Ministers in Egypt will increase cotton acreages in 1955 by 10% over acreage allowed by Law 203 of 1952, and will result in cotton cultivation on 40% of cultivated land in both Lower and Upper Egypt. An earlier announcement had permitted cotton cultivation for 1954 to reach 33⅓% of cultivated land in Lower Egypt and 40% in Upper Egypt. The Government's decision to increase cotton acreage for Karnak in Lower Egypt, and Ashmouni in Upper Egypt was preceded by publication of a decrease in the Government purchasing price for wheat during the 1954-55 crop year. The 1954-55 cotton acreage is officially estimated at 1,639,000 acres and it is expected to reach 1,800,000 to 2,000,000 in 1955-56. Cotton area in 1953-54 totalled 1,375,000 acres.

The first official estimate placed the 1954-55 cotton crop in Egypt at 1,503,000 bales (500 lb. gross), but private estimates average about 1,600,000 bales. The latter figure is about 10% above 1953-54 production of 1,461,000 bales. Some modification of earlier estimates resulted from an August heat wave, late insect damage, and diversion of irrigation water to the rice crop.

Egypt's cotton exports in the year ended July 31, 1954, amounted to 1,485,000 bales, a decrease of 14% from exports of 1,727,000 bales in 1952-53. The three major export markets for Egyptian cotton in 1953-54 were India, France, and the United Kingdom. Exports to the United Kingdom increased sharply in 1953-54 over the previous year, in contrast to decreases in those to most of the other European countries. Shipments to the United States dropped about 18% from the previous year. Exports to the U.S.S.R. dropped from 104,000 bales in 1952-53 to none in 1953-54